FINAL ENVIRONMENTAL ASSESSMENT
FOR
EFFLUENT IRRIGATION OF THE GOLF COURSE
HOLLOMAN AIR FORCE BASE
OTERO COUNTY, NEW MEXICO

U.S. Air Force
49th Fighter Wing
49th Civil Engineer Squadron
Asset Management Flight
550 Tabosa Avenue, Building 55
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Prepared for:

U.S. Air Force

49th Fighter Wing

49th Civil Engineer Squadron

Asset Management Flight

October 2008

EXECUTIVE SUMMARY

This Environmental Assessment (EA) analyzes the United States Air Force's proposal to construct a supplemental irrigation source for the golf course at Holloman Air Force Base (HAFB), near Alamogordo, New Mexico. The proposal would substitute use of potable water that is currently utilized for irrigation with treated effluent from the Wastewater Treatment Plant (WWTP). The golf course at HAFB is currently irrigated with approximately 70 million gallons per year (mgy) of potable water. Currently 255 mgy of treated effluent is discharged from the WWTP into the wetlands complex at HAFB that provides important wetland and open water habitat to a number of wildlife and bird species. The Proposed Action alternative would divert 70 to 130 mgy of treated effluent from the WWTP for use on the golf course leaving approximately 125 to 185 mgy of effluent flowing into the wetlands complex. In addition to the Proposed Action alternative, two other alternatives are analyzed. The No Action alternative would maintain the flow of all treated effluent into the wetlands complex, while continuing to irrigate the golf course with potable water. A third alternative would irrigate the golf course with a combination of potable water and treated effluent. The EA analyzes the potential for impacts to biological resources, water resources, and land use from these three alternatives.

FINDING OF NO SIGNIFICANT IMPACT
FOR
EFFLUENT IRRIGATION OF THE GOLF COURSE
AT HOLLOMAN AIR FORCE BASE
OTERO COUNTY, NEW MEXICO

Description of Proposed Action: An Environmental Assessment (EA) has been developed in accordance with the requirements of the National Environmental Policy Act of 1969, the Council on Environmental Quality regulations, and implementing regulations set forth in 32 CFR §989 (Environmental Impact Analysis Process), as amended, to analyze a United States Air Force (USAF) proposal to construct a supplemental irrigation source for the golf course at Holloman Air Force Base (HAFB), near Alamogordo, New Mexico. The proposal would substitute use of potable water that is currently utilized for irrigation with treated effluent from HAFB's Wastewater Treatment Plant (WWTP). The golf course at HAFB is currently irrigated with approximately 70 million gallons per year (mgy) of potable water.

Because of the scarcity of potable water in the arid southwest the use of reclaimed wastewater effluent has been proposed for irrigation of the golf course. Such use is approved under HAFB's current effluent discharge permit and was analyzed in the *Holloman Air Force Base Golf Course Wastewater Irrigation Feasibility Study* (Foster Wheeler 2003). Currently 255 mgy of treated effluent are discharged via pipes from the WWTP; some of this flows into the northern end of Lagoon G while the majority of it flows directly into Lake Holloman. The treated effluent flowing into Lagoon G is sufficient to keep the bottom of this lagoon wet and prevent the soil from drying up and becoming airborne. Between Lagoon G and Lake Holloman is a 1.25-mile long storm water drainage channel that sustains small pockets of wetland habitat. This wetland complex – the Lagoon G–Discharge Channel–Lake Holloman Hydrologic System – provides important wetland and open water habitat to a number of wildlife and bird species.

The Proposed Action alternative would divert 70 to 130 mgy of treated effluent from the WWTP for use on the golf course leaving approximately 125 to 185 mgy of effluent flowing into the wetlands complex via existing pipes. The effluent irrigation system would take advantage of the existing effluent line that runs from the WWTP to Lagoon G, adjacent to the golf course. A buried pipeline would be installed off the existing pipeline, run to a 400,000-gallon capacity storage tank (installed as part of this project), and then run from the tank to the irrigation pumping well used to water the golf course.

Description of Alternatives Analyzed: In addition to the Proposed Action alternative, two other alternatives were carried forward for analysis in the EA. The No Action alternative would maintain the flow of all treated effluent (approximately 255 mgy) into the wetlands complex, while continuing to irrigate the golf course with potable water. A third alternative would irrigate the golf course with a combination of potable water and treated effluent; approximately 35 mgy of effluent would be diverted to the golf course and the remaining 35 mgy would come from potable water sources. Approximately 220 mgy of treated effluent would continue to be discharged to the wetlands complex and potable water usage on the golf course would be reduced by 35 mgy.

Summary of Findings: Based on the types of activities involved and the issues identified through internal discussion and public input, the analysis focused on the following:

- Water resources, including surface water and groundwater;
- Biological resources, including sensitive plant and wildlife species, terrestrial communities, and wetland and freshwater aquatic communities; and
- Public concerns for watchable wildlife and waterfowl hunting land uses.

A number of measures would be implemented to minimize the potential for impacts to these resources. Language would be included in the construction contract to specify the limit of permissible ground disturbance allowed during new pipeline and tank installation and heavy equipment and other construction vehicles would not be allowed in areas beyond the defined limit of disturbance. Therefore, construction activity related to the tank placement and pipeline installation would disturb less than 1 acre of land north of Lagoon G. Any plans, standards, or practices required by local, state, or federal law or USAF regulation would be observed in an effort to avoid or minimize impacts to the resources including BMPs commonly included in construction contracts for resource protection at HAFB. Therefore, the analysis in the EA concluded the following:

- There would be no significant impact to environmental justice; cultural resources; air quality; noise; safety; hazardous materials and waste management; soil resources; infrastructure; visual resources; or the social or economic structure of HAFB, the City of Alamogordo, or adjacent communities;
- There would be no significant impact to watchable wildlife and waterfowl hunting land uses (i.e., recreation, bird watching, hiking, or hunting);
- There would be no significant impact to biological resources, including sensitive plant and wildlife species, terrestrial communities, and wetland and freshwater aquatic communities; and
- There would be no significant impact to water resources, including surface water and groundwater.

Finding of No Significant Impact: Based on information and analysis presented in the EA and review of public and agency comments submitted, I conclude that implementation of the Proposed Action alternative would not constitute an action that significantly affects the quality of the human environment due to the findings listed above and expanded upon in the EA. Accordingly, a finding of no significant impact is made for the golf course effluent irrigation project and an environmental impact statement under the National Environmental Policy Act is therefore not necessary.

JEFFREY L. HARRIGIAN 3/19/09
Colonel, USAF
Commander

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1.0 PURPOSE OF AND NEED FOR ACTION

This Environmental Assessment (EA) has been prepared to address a proposal by the United States Air Force (USAF) to construct a supplemental irrigation source for the golf course at Holloman Air Force Base (HAFB), near Alamogordo, New Mexico. The proposal would substitute use of potable water that is currently used for irrigation with treated effluent from the Wastewater Treatment Plant (WWTP) on HAFB. This EA discloses the direct, indirect, and cumulative environmental effects that would result from the proposal as required by the National Environmental Policy Act (NEPA) of 1969 (USC 4321-4347), the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR §§1500-1508), Environmental Impact Analysis Process (EIAP) (32 CFR §989), and applicable Department of Defense (DoD) directives.

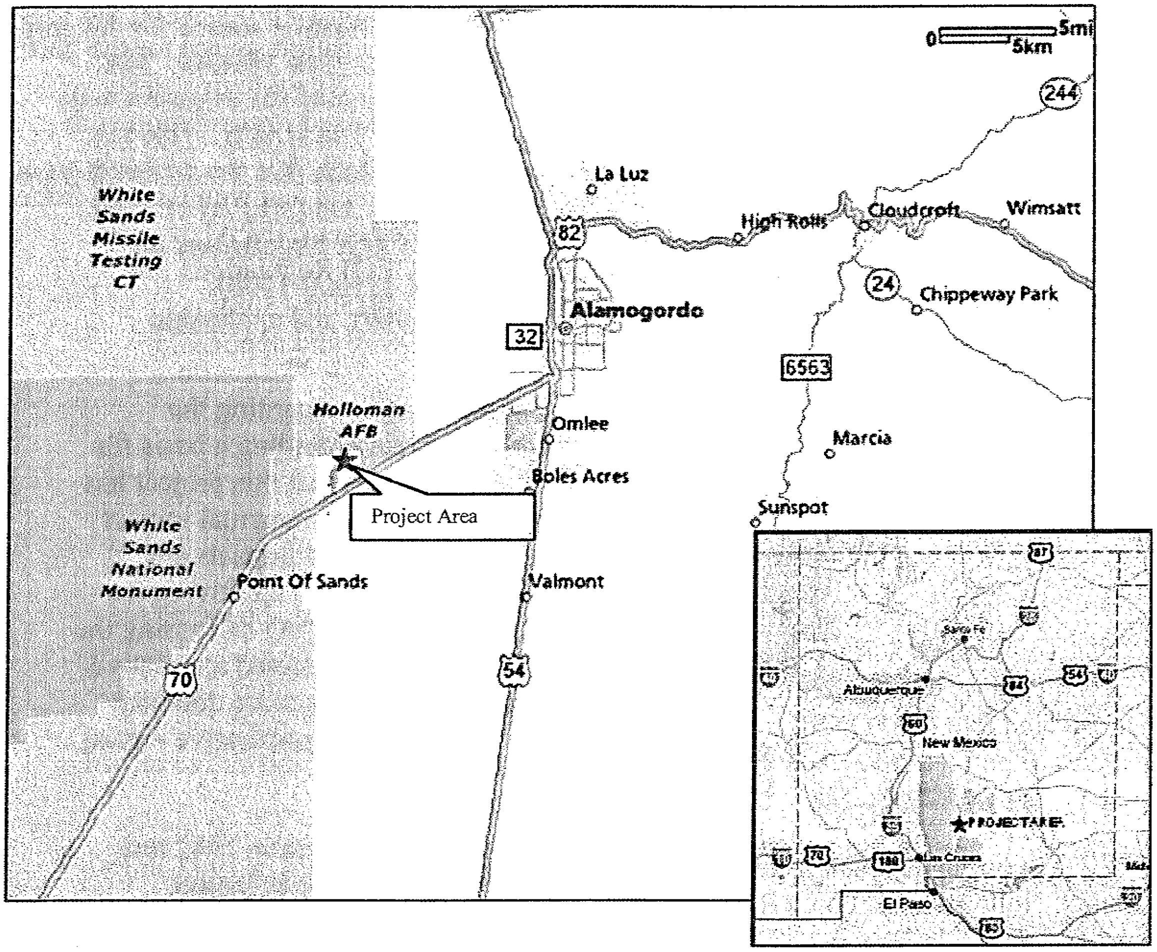
This EA provides the decision maker with pertinent information regarding the environmental impacts of implementing an alternative, therein providing a basis for choice among the alternatives. If the decision maker determines that this project has significant impacts, as defined by 40 CFR §1508.27, then an environmental impact statement (EIS) would be prepared for the project. If no significant impacts are identified, a finding of no significant impact (FONSI) will be signed approving the alternative selected; a Finding of No Practicable Alternative (FONPA) discussing the effects on the wetlands is reasonably expected to result from the selected alternative incorporated into the FONSI. Additional documentation, including more detailed analyses of project-area resources, may be found in the project administrative record.

1.1 BACKGROUND

HAFB was originally established as the Alamogordo Army Air Field in 1942 and renamed Holloman Air Force Base in 1948. The 49th Fighter Wing is located approximately 6 miles west of Alamogordo, New Mexico (Figure 1); HAFB encompasses approximately 59,743 acres of land in the northern Chihuahuan Desert, and supports over 17,000 active-duty USAF personnel, German Air Force personnel, military dependents, civil service employees, military retirees and other civilians.

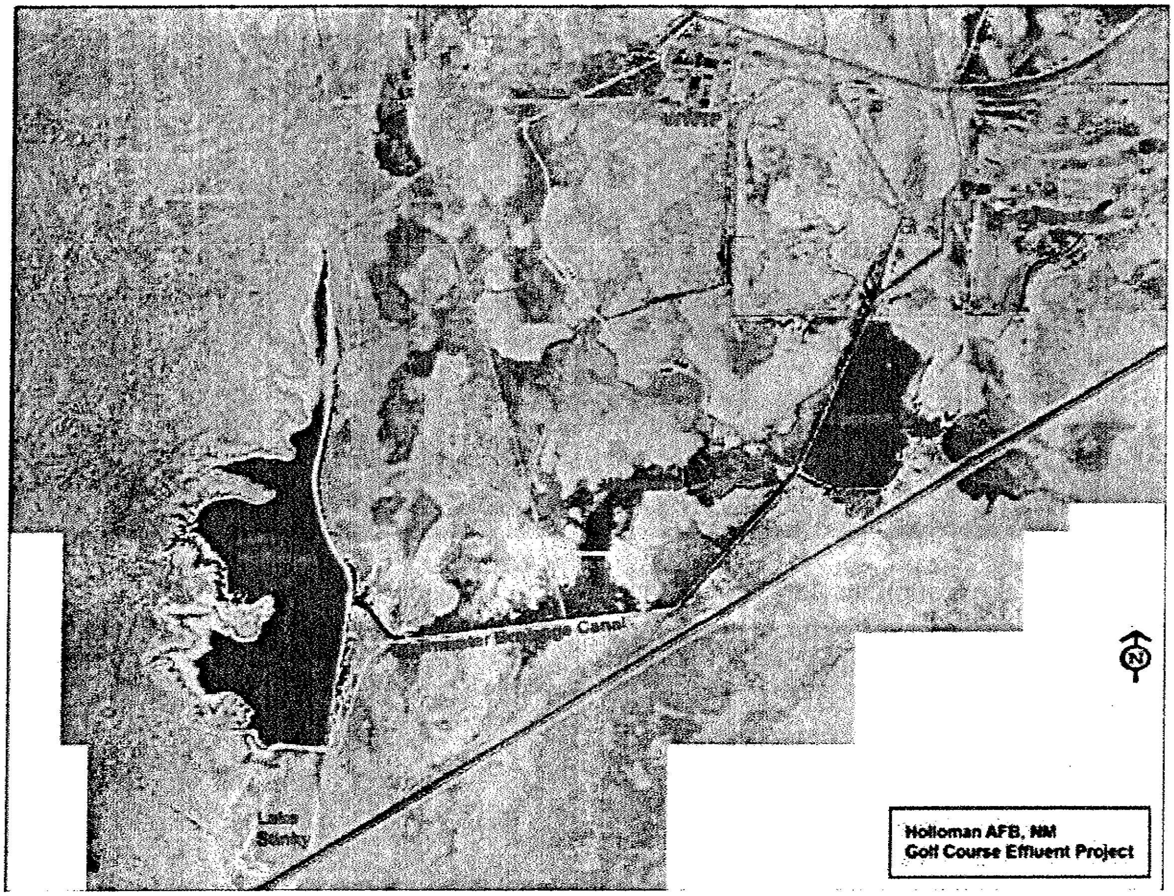
The golf course is located near the southwest boundary of HAFB and consists of nine fairways, a putting green, a driving range, a club house, and maintenance facilities. At present, potable water is used to irrigate the golf course. Because of the scarcity of potable water in the arid southwest, the use of reclaimed wastewater effluent for golf course irrigation has been proposed and analyzed in the *Holloman Air Force Base Golf Course Wastewater Irrigation Feasibility Study* (Foster Wheeler 2003). Such use is approved under HAFB's current effluent discharge permit.

Figure 1. General Project Location Map



Also located in the southwest portion of the Base is the WWTP and a wetland complex containing a lagoon (Lagoon G), Lake Holloman, Lake Stinky (aka Stinky Playa), and intervening drainages and wetland habitat (Figure 2). Jurisdiction of Lake Stinky, Lake Holloman, and the wetland complex (including Lagoon G and the associated storm water drainage channel and wetland habitat), formerly managed by the Bureau of Land Management, was transferred to the USAF under Section 2845 of Public Law 103-337. This law requires that the USAF "permit, on the lands of transfer under subsection (a), public uses that are consistent with the public uses on adjacent lands under the jurisdiction of the Secretary of the Interior."

Figure 2. Location of Golf Course, WWTP, and Wetlands Complex.



Construction of a new WWTP at HAFB was completed in July 1996 (Foster Wheeler 2003). Prior to its construction, effluent flowed into a series of sewage lagoons – named A through G – constructed along a natural drainage system in the southwestern portion of the Base. As construction of the new WWTP commenced, six of the lagoons (A through F) were decommissioned and filled. The last lagoon (Lagoon G) was removed as a treatment unit and restored to a functional wetland that provides important habitat to a number of wildlife and bird species (Figure 3).

Currently 255 million gallons per year (mgy) of treated effluent are discharged via pipes from the WWTP; some of this flows into the northern end of Lagoon G while the majority of it flows directly into Lake Holloman (Figure 4). The treated effluent flowing into Lagoon G is sufficient to keep the bottom of this lagoon wet and prevent the soil from drying up and becoming airborne. Between Lagoon G and Lake Holloman is a 1.25-mile long storm water drainage channel that sustains small pockets of wetland habitat (Figure 5). Hereafter the Lagoon G–Discharge Channel–Lake Holloman Hydrologic System will be referred to as the wetlands complex.

Figure 3. Lagoon G (facing east).

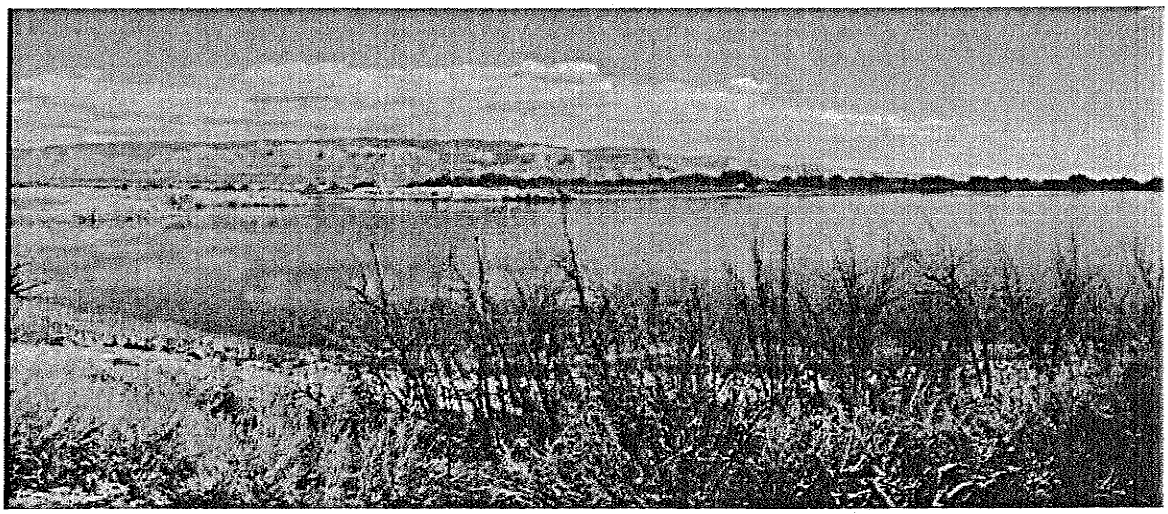


Figure 4. Lake Holloman (left, facing south; right, facing north).

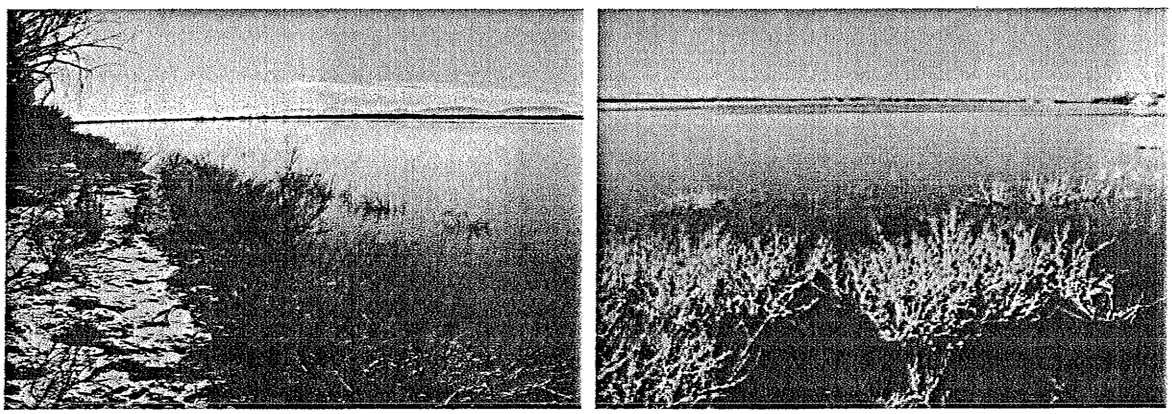
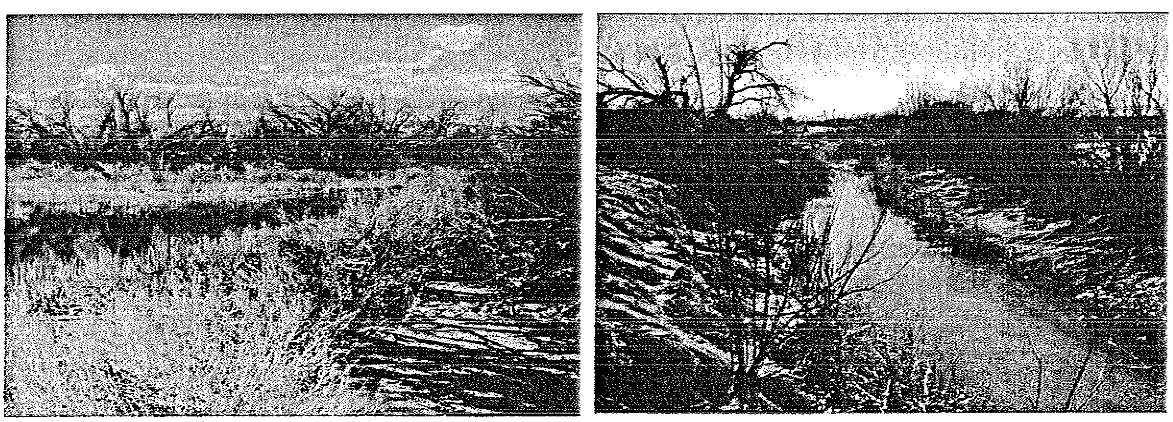


Figure 5. Discharge channel from Lagoon G (left, facing southwest) and to Lake Holloman (right, facing east).



1.2 PURPOSE OF AND NEED FOR ACTION

The purpose of this proposed action is to reduce the amount of potable water used to irrigate the golf course on HAFB. The proposed action would achieve this purpose by replacing a percentage of the potable water that is used to irrigate the golf course with treated wastewater effluent from the WWTP. The project is needed to increase the availability of potable water for other uses at HAFB and within the City of Alamogordo (e.g., mission support, residential uses, and human consumption).

1.3 SCOPE OF THE ANALYSIS

1.3.1 Environmental Impact Analysis Process (EIAP)

32 CFR §989, EIAP, requires the USAF to address environmental impacts through consideration and documentation of the environmental effects of a proposed action, as well as reasonable alternatives to the proposed action and the "no action" alternative. Every EA must lead to either a FONSI, a decision to prepare an EIS, or no action on the proposal. The EIAP procedures ensure compliance with NEPA and the CEQ Regulations.

1.3.2 Regulatory Compliance

This EA has been prepared to comply with NEPA. It addresses the Proposed Action alternative's compliance with other applicable environmental laws and regulations including the Historic Site Act of 1935; Clean Air Act of 1970; Endangered Species Act of 1973 (ESA); Clean Water Act of 1977 (CWA); National Historic Preservation Act of 1979; and Fish and Wildlife Conservation Act of 1980. The USAF (or construction contractor for the project) would acquire any permits and licenses required for the proposed placement of the pipeline and water storage tank. No permits beyond those already in place at HAFB would be required for the No Action alternative.

Executive Order 11990, *Protection of Wetlands*, requires that federal agencies avoid, where possible, impacts to or loss of wetlands. The CWA regulates development activities in or near streams and wetlands. Section 402 of the CWA requires a storm water permit for discharges from construction sites of 1 to 5 acres. A general permit including a Storm Water Pollution Prevention Plan (SWPPP) and Erosion and Sediment Control Plan with site-specific best management practices (BMPs) may be needed.

HAFB currently has a Groundwater Discharge Permit (DP-1127) for effluent application at the golf course. Treated and disinfected effluent is discharged under National Pollutant Discharge Elimination System (NPDES) permit (No. NM0029971) to a free water surface constructed wetlands complex, an unlined lagoon, the unnamed jurisdictional wetlands, or to Lake Holloman. Irrigation of golf courses is considered a Class 1B use according to a draft New Mexico Environment Department (NMED) policy for the use of reclaimed effluent (NMED 2003). Class 1B use requires that water quality effluent standards be met at the discharge point of the wastewater treatment plant (see NMED Ground Water Quality Bureau Guidance 2007). The policy also specifies infrastructure and operational requirements that must be adhered to; most of the requirements can be readily implemented and would not be a hindrance to irrigation with reclaimed effluent.

Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, requires a two percent annual reduction of federal facilities water consumption intensity between 2008 and the end of the fiscal year 2015, relative to the baseline water consumption in fiscal year 2007. The watering of the Golf Course with effluent from the WWTP would directly add to HAFB's ability to reach this goal.

1.3.3 Public and Agency Involvement

Intergovernmental notification prior to making a detailed statement of environmental impacts is required by Executive Order 12373, *Intergovernmental Review of Federal Programs*. The USAF is required to notify concerned federal, state, and local agencies and allow them sufficient time to evaluate potential impacts of a proposed action through the Interagency and Intergovernmental Coordination for Environmental Planning (IICEP) process. Those agencies – and other vested interest groups and private individuals – were given an opportunity to comment on the selection criteria, scope, and resulting analysis in the EA during the public comment period (Appendix A). Public notification of the availability of the EA was published in the Alamogordo Daily News, the Las Cruces Sun-News, the Ruidoso News, and the El Paso Times informing the public of 30 day public comment period on the EA (Appendix B). No comments were received from the public.

1.4 ENVIRONMENTAL ISSUES

1.4.1 Relevant Issues Analyzed in Detail

Through the NEPA process relevant environmental issues were identified. This list of issues was derived from the potential for impacts based on an understanding of local conditions and the nature of the proposed work. They include:

- Water resources, including surface water and groundwater;
- Biological resources, including sensitive plant and wildlife species, terrestrial communities, and wetland and freshwater aquatic communities; and
- Public concerns for watchable wildlife and waterfowl hunting land uses.

1.4.2 Issues Eliminated from Detailed Analysis

The following elements were initially considered on AF Form 813, *Request for Environmental Impact Analysis* (signed February 27, 2008), but determined to not warrant detailed analysis. The rationale for dismissing these elements from detailed analysis is presented in Appendix C.

- Environmental Justice
- Cultural Resources
- Soil Resources
- Air Quality
- Noise
- Safety
- Infrastructure
- Visual Resources
- Socioeconomics
- Hazardous Materials and Waste Management

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

This section describes the alternatives considered for the proposed project and provides a basis for choice. Personnel from the environmental and engineering departments worked together to develop alternatives for construction of a supplemental irrigation source for the golf course. Field surveys and resource information from the wetlands complex area were used to develop a list of resource concerns to be considered in the analysis. The alternative action was refined to minimize its potential impact on the environment based on that information.

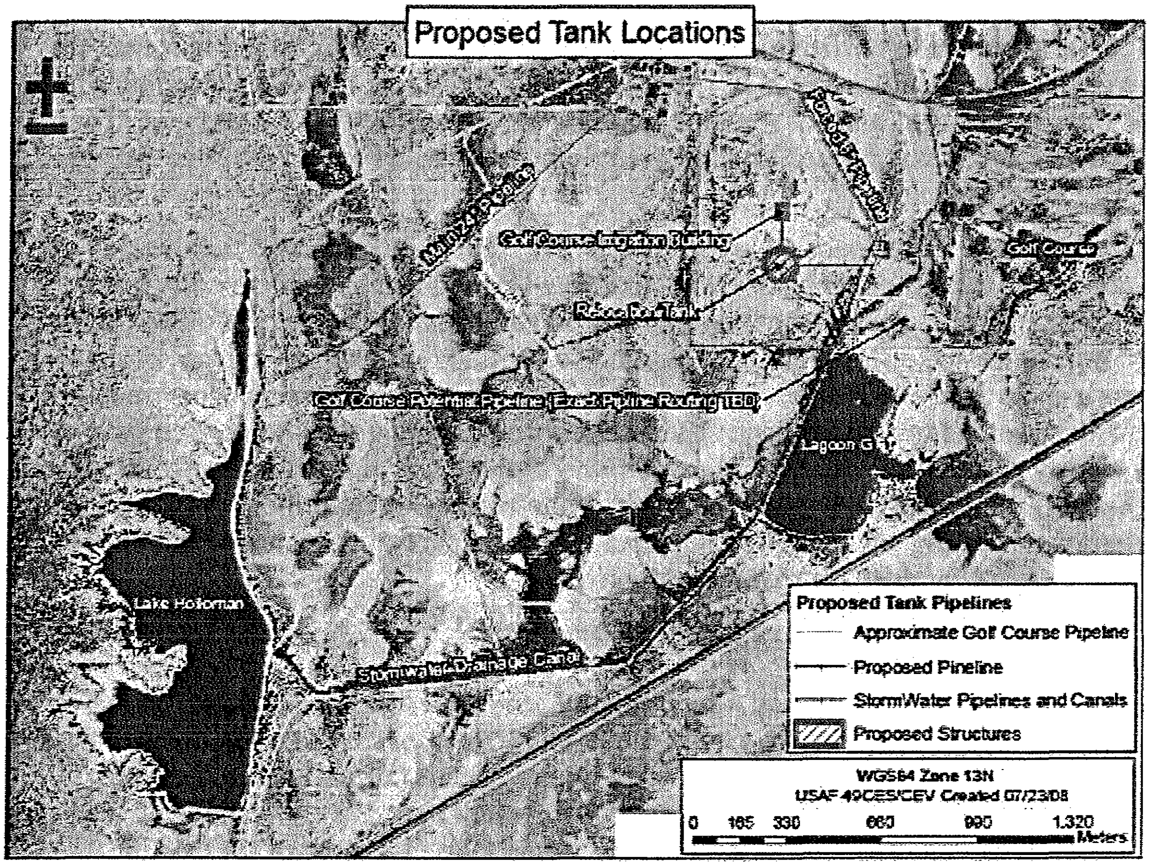
Three alternatives are analyzed in this EA: the No Action alternative (which would continue irrigating the golf course with potable water and would not divert any treated effluent to the golf course), the Proposed Action alternative (which would divert 70 to 130 mgy of treated effluent to the golf course to be used for irrigation in place of potable water), and a third alternative which would irrigate the golf course with a combination of potable water and treated effluent. The feasibility of irrigating with wastewater was previously examined in the *Holloman Air Force Base Golf Course Wastewater Irrigation Feasibility Study* (Foster Wheeler 2003). The alternatives are described below along with criteria for selecting an alternative. Other alternatives that were considered but not carried forward for analysis are also presented below.

2.1 ALTERNATIVE A: PROPOSED ACTION

The USAF proposes to construct a supplemental irrigation source for the golf course on HAFB (Figure 6). The proposal would use 70 to 130 mgy of treated effluent from the WWTP for irrigation in place of the potable water which is currently used, leaving approximately 125 to 185 mgy of effluent flowing into Lagoon G and Lake Holloman via existing pipes. The effluent irrigation system would take advantage of the existing effluent line that runs from the WWTP to Lagoon G, adjacent to the golf course. Water storage is a necessary component of this system because the rate of effluent generation does not match the rate of water application during the irrigation cycle; the application rate for irrigation is twice the average rate of effluent generation, thus a supply of treated effluent would need to be built up prior to each irrigation cycle. Placement of a large water storage tank near the effluent line would be part of the Proposed Action alternative.

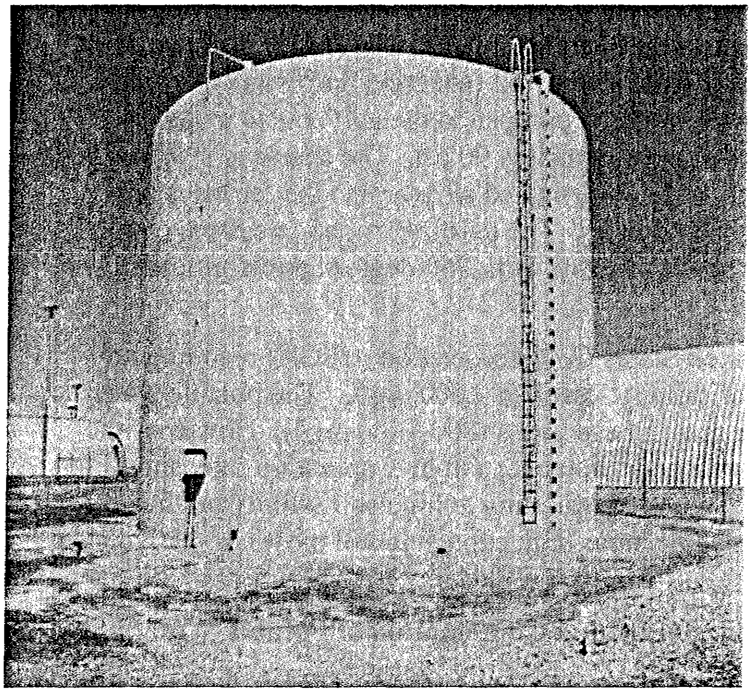
A storage tank of sufficient capacity and condition is available at HAFB (Figure 7). It is an out-of-service, 400,000-gallon capacity, fire water tank presently located adjacent to Building 803 at Bear Base. Under this alternative, the tank would be moved to a location north of Lagoon G between the WWTP effluent pipeline and the golf course irrigation pumping building. The tank would be placed on a constructed concrete foundation.

Figure 6. Proposed Water Tank and Effluent Line Location.



A pipeline necessary for this project would tee off the Lagoon G pipeline, run to the storage tank, and then run from the tank to the irrigation pumping well used to water the golf course. Along with the buried pipeline, three remotely operated valves would be installed and controlled by a SCADA (Supervisory Control and Data Acquisition) system. One valve would open the effluent flow into the storage tank, the second would block the flow into Lagoon G, and the third valve would control the release of the water from the tank to the pumping well. Installation of the tank, pipeline, and control valves is anticipated to begin in the fall of 2008 or spring of 2009; with construction taking approximately 30 days.

Figure 7. Proposed Water Storage Tank.



2.1.1 Actions to Reduce Potential for Environmental Impacts

Construction activity related to the tank placement and pipeline installation would disturb less than 1 acre of land north of Lagoon G. Language would be included in the construction contract to specify the limit of permissible ground disturbance allowed during new pipeline and tank installation. Any plans, standards, or practices required by local, state, or federal law or USAF regulation would be observed including BMP commonly included in construction contracts for resource protection at HAFB.

Heavy equipment and other construction vehicles would not be allowed in areas beyond the defined limit of disturbance. BMPs would be used to control dust and soil erosion during construction. Specifications regarding temporary controls for erosion, sediment and water pollution would be included in the construction/contract documents. A comprehensive list of BMPs is contained in the base-wide SWPPP.

2.2 ALTERNATIVES TO THE PROPOSED ACTION

The alternatives listed below are being carried forward for consideration in the analysis.

2.2.1 Alternative B: No Action Alternative

The No Action alternative provides a baseline condition from which to evaluate the potential consequences of not changing the irrigation source of water for the golf course. This "no change" scenario would maintain the flow of all treated effluent (approximately 255 mgy) into the wetlands complex, while continuing irrigation of the golf course with potable water. Other improvements to the golf course could still occur under this and the other alternatives – including improvements in irrigation practices (e.g., directional sprinkler heads) and turf condition (e.g., drainage improvements, salt- and drought-tolerant landscaping plants) – but no wastewater would be used for irrigation.

The golf course at HAFB is managed under contract by Miranda Landscaping, which also manages the City of Alamogordo golf course (the city golf course is already irrigated by treated effluent from the city's wastewater treatment plant). The HAFB golf course is currently irrigated with potable water from a wet well (concrete lined vault) located west of the golf course. From the wet well, water is pumped to the golf course irrigation system via pipeline and is delivered at approximately 90 psi. The course is irrigated for 6 to 7 hours a night: the tee and green areas are irrigated all year and the fairways are watered three times a week during the summer. The existing irrigation system (sprinklers on two parallel water pipes buried in the fairways with 360-degree sprinkler heads) is a common type used on golf courses.

Water quality guidelines of the United States Golf Association (USGA) recommend irrigating golf courses with water of salinity less than 1,000 mg/L. The potable water source currently used for irrigation meets these limits (800-1000 mg/l). However, the golf course is located in low land with poor drainage, a high evaporation rate, and a shallow high alkaline water table. This is contributing to high soil salinity on the golf course, with salts concentrations in some areas high enough to kill most non-native plants (Foster Wheeler 2003).

2.2.2 Alternative C: Irrigation with a Combination of Potable Water and Treated Effluent

Under this alternative, a combination of potable water and treated effluent would be used to irrigate the golf course. This alternative would divert approximately 35 mgy of effluent to the golf course and the remaining irrigation need of 35 mgy would come from potable water sources. Approximately 220 mgy of treated wastewater would continue to be discharged to the wetlands complex and potable water usage would be reduced by 35 mgy.

Treated effluent and potable water could be blended at a 1:1 ratio to irrigate the golf course. Installation of purple-colored pipe is required to identify the effluent lines. This alternative would still require installation of the pipeline and storage tank described under the Proposed Action alternative, and all construction activities, required permits, and BMPs would be the same as required for the Proposed Action alternative.

2.3 METHODOLOGY FOR ALTERNATIVE IDENTIFICATION

2.3.1 Minimum Selection Criteria

Required evaluation criteria for the alternatives considered included the following:

- Maintain sufficient water levels in Lagoon G to keep the soil from drying up and becoming airborne. Soils in Lagoon G may contain hazardous constituents from past effluent discharges; by keeping the soils covered with water, potential risks to human health can be minimized (USAF 1995).
- Maintain sufficient water levels in the wetlands complex to provide habitat for wildlife and waterfowl.

2.3.2 Desirable Selection Criteria

In addition to the minimum requirements identified above, the following characteristics were also considered to be desirable for the selected alternative:

- Save potable water currently used for irrigation on the golf course for other uses.
- Meet USAF Morale, Welfare, and Recreation (MWR) goals by keeping the golf course open.

2.4 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

In addition to the alternatives described in detail, two other alternatives were considered during project analysis. These alternatives are described below along with the rationale for why they were eliminated from further consideration.

2.4.1 No Irrigation

The "no irrigation" alternative would discontinue irrigating the golf course with any water while continuing to discharge the effluent to the wetlands complex. This alternative would conserve the potable water currently being used to water the golf course, but would ultimately deprive golfers and other military personnel of grass on the fairways and greens. While a dry desert course is possible, it is not desirable. This alternative was dismissed from further analysis because it would not meet the MWR goals.

2.4.2 No Discharge to Lagoon G

Under the "no discharge" alternative, all of the water currently being discharged to the wetlands complex would be diverted for use on the golf course. This alternative would allow the golf course to increase irrigation application rates, keeping more of the golf course green, or could even allow the golf course to expand to 18 holes from the current 9. This alternative would eliminate the need for potable water to irrigate the golf course and would make approximately 70 mgy of potable water available for other uses. It may present a salinity issue as the discharge water is still above the recommended 1000 mg/l standard. Also, eliminating discharge of treated effluent to the wetlands complex would result in the destruction of wildlife and waterfowl habitat, depriving the public of a "Watchable Wildlife" site and violating the conditions of the land acquisition legislation. Due to these limitations this alternative was eliminated from further study.

2.5 COMPARISON OF VIABLE ALTERNATIVES

This EA addresses the potential environmental impacts that could result from diverting a portion of the treated effluent that currently flows into the wetlands complex and supports wildlife and waterfowl populations to the golf course for use in irrigation in place of potable water. Previously drafted environmental documents (Foster Wheeler 2003, HAFB 2000, Parsons 1995, USAF 1995, Smith and Johnson 2005) relevant to the project area and the proposed project were used as part of this assessment. Based on the types of activities involved and the issues identified through internal discussion and public input, resources of concern were limited to biological resources, water resources, and watchable wildlife and waterfowl hunting land uses. Table 1 summarizes the environmental

impacts to these resources from the three alternatives carried forward for analysis. A detailed impact analysis is contained in Section 4: *Environmental Consequences*.

Table 1. Summary of the Alternatives and Impact Analysis.

Resource	No Action Alternative	Proposed Action Alternative	Alternative C: Combined Sources
Potable water used on the golf course for irrigation	70 mgy	0 mgy	35 mgy
Effluent that would be diverted to the golf course for irrigation use	0 mgy	70 to 130 mgy	35 mgy
Effluent flowing from WWTP to the wetlands complex	255 mgy	125 to 185 mgy	220 mgy
Vegetation	No change	An insignificant amount of vegetation could be removed during installation of the tank and pipeline but these effects would be short term and localized	Same as Proposed Action
Wildlife and Migratory Birds	No change	The reduction in effluent flow to Lagoon G will be compensated by controlling the effluent discharge direction (Lagoon G vs. Lake Holloman) such that water will be directed to Lagoon G during late fall-winter-early spring migration season and to the golf course during the late spring-summer-early fall season, with surplus water going to Lagoon G to keep it wet and/or to Lake Holloman for disposal. The reduction in effluent flow to Lake Holloman will be compensated by groundwater inflow (the water level in Lake Holloman is closely tied to the water table level).	Similar to the Proposed Action although less compensatory effluent flow will be required to keep Lagoon G wet and more surplus water will be diverted to the wetlands complex. The reduction in effluent flow to Lake Holloman will be compensated by groundwater inflow (the water level in Lake Holloman is closely tied to the water table level).
Land Use (Recreation, Bird Watching, Hiking, Hunting)	No change	No change	No change

3.0 AFFECTED ENVIRONMENT

This section describes the existing environmental resources, namely the biological and water resources of the project area, which could be potentially impacted by implementation of the alternatives proposed for the golf course effluent project. The description of the resources provides a baseline from which to identify and evaluate any environmental changes likely to result from implementation of the Proposed Action or alternatives.

3.1 GENERAL SETTING

HAFB is located within the Tularosa Basin in the northernmost part of the Chihuahuan Desert province. The climate is typical of the southwestern desert with hot, dry summers and mild winters. Precipitation is low and averages 7.9 inches per year with peak rainfall occurring during the summer months. Evaporation exceeds rainfall – lake evaporation is estimated at 67 inches per year (USAF 1995) – with maximum net evaporation occurring in May and June and minimum evaporation occurring in December and January.

Intermittent streams and arroyos in the basin lowlands generally contain water only during infrequent periods of heavy rainfall. The Tularosa Basin in this area lacks an external outlet which, in combination with a high soil water table, leads to soil salinization. The combination of high temperatures, limited rainfall, and high evaporation within this province favors drought-tolerant vegetation and areas of high salinity favor salt-tolerant species.

3.2 WATER RESOURCES

Water resources consist of both surface water and water present beneath the ground surface. Potential modifications to wetlands are addressed in accordance with Executive Order 11990, *Protection of Wetlands*. The U.S. Army Corps of Engineers is the government entity charged with the authority for regulating wetlands. Wetlands are defined as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR §328.3). Waters of the U.S. are defined in that section as "All other waters such as lakes, rivers, streams (including intermittent streams), mudflats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds..." Designated 100-year floodplains – delineated in accordance with Executive Order 11988, *Floodplain Management* – are also typically included in discussions of water resources; however, no designated 100-year floodplains are located in the project area. Southwest water management practices must make the best use of available resources. NMED water conservation practices recommend the use of effluent for recreation area (golf course) irrigation. Water needs for maintaining an artificial wetland must be balanced with the artificial green area of the golf course.

Small construction activities that disturb areas of 1 acre or larger must comply with the Environmental Protection Agency's Phase II Storm Water General Permit for Small Construction. Compliance with the permit is intended to improve or maintain water quality by minimizing pollutants in storm water runoff that is discharged into the drainage system. It requires issuance of a Notice of Intent, development and

implementation of a site-specific SWPPP and an Erosion and Sediment Control Plan (ESCP), and maintenance of control measures. The SWPPP and ESCP include temporary and permanent stabilization of disturbed areas and the installation and maintenance of BMPs. The Storm Water General Permit may be waived for activities occurring during periods of low rainfall (i.e., September through June) at HAFB (EPA 2001). These permitting conditions are not expected to apply to the proposed actions/alternatives as less than 1 acre of disturbance is anticipated.

3.2.1 Existing Conditions

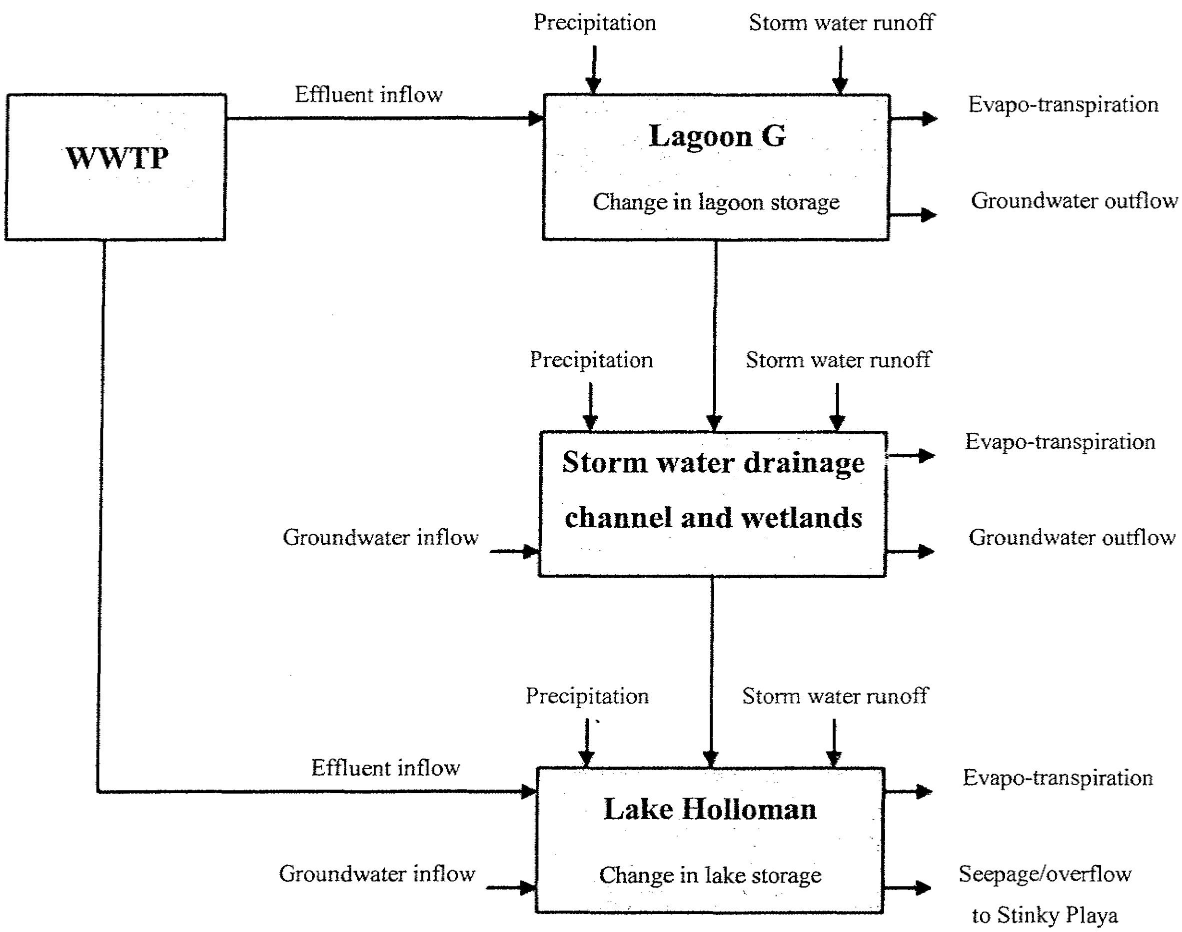
There are no perennial streams on HAFB or in the surrounding area. However, several arroyos cross HAFB and flow intermittently, primarily with storm water runoff and generally in a southwest direction. Most precipitation events in the area occur as summer monsoons and large storm events falling on the slopes of the Sacramento Mountains. Precipitation is absorbed quickly by the gravels and silty sandy soils at the base of the alluvial fans, often before water reaches the terminal playas in the basin floor. During these precipitation events, runoff that is not immediately absorbed flows down gradient toward the center of the basin via numerous shallow cuts and arroyos, which create a random network of drainages that abruptly end or gradually disappear as water seeps into the soil, or moves as groundwater through alluvial deposits and permeable formations below the stream channels (NMISC 2002). Seasonal precipitation events can create ponds in the saturated soils of swales and playas in the lowland areas. Flooding occurs at the lower elevations and margins of the basin floor during heavy precipitation events.

Groundwater recharge occurs largely from rainfall and snowmelt in the Sacramento Mountains. The major streams (Three Rivers, Tularosa Creek, and La Luz Creek) are all captured by resident populations for household and irrigation uses. The normal flows of lesser drainages such as Laborcita Canyon, Alamo Canyon, and Fresnal Canyon are completely captured by the city of Alamogordo. Normal flow from the lesser drainages and that is not captured due to a lack of capacity, rapidly infiltrates into the course, loosely consolidated alluvial fans at the foot of the mountains. Heavy precipitation events on the mountains result in stream flow beyond the need and ability to capture it, causing flash flooding that extends miles out into the basin floor where water infiltrates the fine grain, consolidated basin fill. Several predominately dry stream channels (arroyos) including Dillard Draw on the east and south boundary of the Base carry flood waters to or across HAFB. Dillard Draw flow now generally terminates near the southeast corner of the Base, but relict flow patterns shown on early aerial photography indicate that Stinky Playa (aka Lake Stinky) was the terminal playa for Dillard Draw as well as the several thousand acres of the Base that drain to the current wetlands complex. Seventy percent (70%) of Alamogordo's potable water supply comes from surface flow capture. HAFB potable water is half groundwater from wells on the foot of the Sacramento Mountains and half from Alamogordo's supply system which includes Lake Bonito (near Alto, New Mexico). Private Household and farm irrigation water is lifted from the basin groundwater. This primary basin aquifer saturates alluvia that are very thick and has a high salinity that increases with the distance from the mountains. The best sources for fresh potable groundwater are located at major drainage alluvial fans around the edges of the basin (NMWQCC 2002).

The hydrology of the immediate project area is dominated by several features that form a connected hydrologic system. The principle components of the wetlands complex are: Lagoon G, the storm water drainage channel and associated wetlands, Lake Holloman, and Lake Stinky (see Figures 2–5). The stratigraphy of the project area consists of a layer of silt or sand underlain by a layer of saturated sand or silty sand. The wetlands complex in the project area is in great part a result of man-made features.

Figure 8 presents a schematic drawing of the wetlands complex hydrologic system. The water balance components of this system include the WWTP, Lagoon G, the storm water drainage channel and associated wetlands, groundwater, and Lake Holloman. Flows into the wetlands complex include effluent from the WWTP, storm water surface runoff, direct precipitation, and in the case of Lake Holloman, groundwater inflows. Flows out include evaporation, transpiration, groundwater outflows (Lagoon G and typically the drainage channel and associated wetlands), and seepage or overflow to Lake Stinky. Subsequent sections describe each of these components.

Figure 8. Water Balance Components for the Wetlands Complex at HAFB



3.2.2 WWTP Effluent Flows

HAFB sewage effluent was discharged to a series of aeration lagoons until 1995 when these lagoons were replaced by the present WWTP. Presently, effluent from the WWTP is discharged by pipeline directly to Lagoon G and to Lake Holloman (Figure 8). Sufficient effluent flows to Lagoon G to ensure that the soils on the bottom of it remain unexposed. Concern has been expressed about any change in the operation of the system that could result in unplanned exposure of the lagoon bottom which in turn could expose potentially contaminated soil present on the bottom of the lagoon (USAF 2000).

Decreased effluent releases to the wetlands complex have occurred over time and are attributed to decreases in the population at HAFB, water conservation efforts, and remediation of sewer lines. The population at HAFB has decreased over time due to changing missions and with demographic changes. This decreased population has resulted in a decrease in wastewater inflow to the WWTP over the last 10 years. Limited potable water supplies in the Tularosa Basin have required implementation of water conservation strategies at HAFB further reducing inflow to the WWTP. These strategies have included installation of water saving plumbing fixtures in residences and more water-efficient practices for Base landscaping. Because of the shallow groundwater levels at HAFB – commonly occurring within a few feet of the land surface – much of the HAFB sewer system has been constructed within saturated sediments. Leaky sewer lines acted as drains, collecting and conveying groundwater flow to the WWTP. In the early 1990s, many of these lines were repaired, further reducing inflows to the WWTP.

In 1987, releases averaged approximately 1.5 million gallons per day (mgd) with a maximum release of approximately 2.5 mgd and a minimum release of approximately 1.0 mgd. By 2007 releases had declined to approximately 0.7 mgd with a maximum monthly release of 1.33 mgd and a minimum of 0.39 mgd. Monthly effluent data from 1995 to the present do not indicate any seasonal fluctuations in releases from the WWTP.

This water balance assessment is based on an average of 0.7 mgd (255 mgy) of effluent inflow as derived from present releases to the wetlands complex from the WWTP. This estimate is made with the assumption that the Base population will not decrease in the future. Because the relative proportion of effluent flowing to Lake Holloman or Lagoon G can be controlled, for purposes of this water balance assessment it is assumed that approximately 40% (0.28 mgd) of the effluent currently flows to Lagoon G and 60% (0.42 mgd) flows to Lake Holloman.

3.2.3 Lagoon G

Lagoon G, which is located southwest of the golf course, encompasses approximately 50 acres, and is one of a series of seven man-made sewage lagoons of which six have been decommissioned and filled. Lagoon G was constructed in an area of historic wetlands and continues to receive storm water drainage from a contributing area east of the lagoon. Any discharge from Lagoon G is commingled with storm water drainage and other surface runoff. A ditch approximately 15 feet wide and 1.25 miles long, with an elevation change of about 5 feet, connects Lagoon G and Lake Holloman. This open channel leading to Lake Holloman from Lagoon G traverses the wetland area.

Inflows to and outflows from Lagoon G consist of effluent discharge from the WWTP, precipitation and storm water runoff, evaporation and transpiration, groundwater flows, and discharge to the storm water drainage channel. Subsequent sections describe the magnitude of these inflows and inflow trends.

Precipitation and Local Storm Water Runoff

The combined drainage areas of the wetlands complex are estimated to encompass a total of 2,770 acres (Parsons 1995). The amount of precipitation to these drainages in a single storm must exceed 1.52 inches to create runoff as estimated in the Lake Holloman Water Balance Study (Parsons 1995). The present water balance assessment is based on a conservative estimate of no inflows from storm water runoff.

Direct precipitation on the lagoon surface and surrounding wetlands can provide a significant inflow of water. Assuming a rainfall total of 7.9 inches per year on the 50 acres encompassed by Lagoon G, this inflow may be as much as 10 mgy or 0.03 mgd. The present water balance assessment conservatively disregards this inflow component, assuming that precipitation for an extended period of time is minimal.

Evaporation and Transpiration

Evaporation losses from the open-water surface and transpiration losses from vegetated wetlands around the lagoon margins account for a significant outflow from Lagoon G. Evaporation and transpiration losses fluctuate seasonally. Evaporation losses increase with increases in temperature and plant transpiration increases during the active growing season. These losses are considered to be minimal during the cooler winter months, and peak during the hotter summer months. Increased summer losses are partially offset by summer monsoonal rainfall.

Based on a 2004 aerial survey, the area of the present open-water pool is 29 acres and the total area within the Lagoon G dikes encompasses 50 acres. Pan evaporation measurements for similar areas (Jornada Experimental Range, 1935-1979, and New Mexico State University, 1979-1994) average 7.5 feet per year. Previous studies of the wetlands complex at HAFB have been based on an estimated 70 to 75 percent of pan evaporation, or 5.25 to 5.62 feet per year. The present water balance assessment is based on an estimated 5.62 feet per year of losses for the area of open water and adjoining wetlands. This outflow from the system conservatively assumes that transpiration losses are the same as open-water evaporation losses. For a combined surface area of 50 acres, evaporation losses are estimated to be 92 mgy or approximately 0.25 mgd.

Groundwater Flows

The depth to groundwater in the vicinity of Lagoon G is near land surface as indicated by shallow groundwater levels (1.5 feet below land surface) immediately to the east. Because Lagoon G is slightly above the water table, groundwater inflows to the system are generally unlikely. The low permeability of saturated sediments likely precludes large inflows to and outflows from Lagoon G. The present water balance assessment assumes that groundwater outflows from Lagoon G can generally be balanced by diverting a greater proportion of treated effluent flowing to Lake Holloman to Lagoon G, sufficient to keep the ground surface saturated. Therefore groundwater outflows are conservatively estimated to be 0.02 mgd.

Discharge to the Storm Water Drainage Channel

Based on the net inflows to and outflows from Lagoon G, an estimated 0.01 mgd of water is discharged to the storm water drainage channel during extended periods of minimal precipitation. This rate of flow will increase with storm runoff and will decrease in response to decreases in effluent discharges.

Change in Storage

The altitude of the water surface in Lagoon G is controlled in part by check boards at the headgate to the storm water drainage channel. Storm water inflows can temporarily increase water in storage. Decreases in inflows can drop the water level below the check boards, reducing discharge to the storm water drainage channel. The present water balance assessment assumes a long-term dynamic equilibrium in which the water level and the amount of water in storage in Lagoon G remain constant.

3.2.4 Storm Water Drainage Channel and Wetlands

Inflows to and outflows from the storm water drainage channel and associated wetlands include discharges from Lagoon G (estimated to be 0.01 mgd during extended dry periods), inflows from precipitation and storm water runoff, evaporation and transpiration, groundwater inflows, outflows, and discharge to Lake Holloman.

Precipitation and Local Storm Water Runoff

As previously noted, the combined drainages contributing storm water runoff to the wetlands complex total approximately 2,770 acres. Storm water runoff is controlled by the amount of rainfall in a single storm. The present water balance assessment conservatively considers that precipitation and this source of inflow to the wetlands are minimal, variable, and not easily quantified. Direct precipitation on the storm water drainage channel and surrounding wetlands can provide a minor source of inflow of water. The present water balance assessment disregards this inflow component, assuming that precipitation for an extended period of time is minimal.

Evaporation and Transpiration

The storm water drainage channel and adjoining wetlands lying between Lagoon G and Lake Holloman is estimated to encompass a total of 1.8 acres. Evaporation and transpiration losses from this area are estimated using an estimated evapo-transpiration rate of 5.62 feet per year to be 3.3 mgy or approximately 0.001 mgd. A conservative estimate that includes an additional 10 acres of adjoining vegetated areas results in evaporation and transpiration losses totaling 0.01 mgd.

Groundwater Flows

Groundwater inflows and outflows along the length of the drainage channel and associated wetlands likely fluctuate seasonally in response to precipitation events and to changes in the altitude of the surface of Lake Holloman relative to the water table. The present water balance study assumes that groundwater inflows and outflows are in dynamic equilibrium with Lake Holloman and the net sum of inflows and outflows to Lake Holloman is zero.

Discharge to Lake Holloman

Based on the net inflows to and outflows from the storm water drainage channel and associated wetlands, a net sum of zero discharge to Lake Holloman is anticipated in the present water study although this rate of flow could increase with storm runoff and in response to increases in effluent discharges through Lagoon G.

3.2.5 Lake Holloman

Lake Holloman and Lake Stinky (sometimes referred to as Stinky Playa) were created from a single natural formation (the Dillard Draw termination playa) and are separated by a non-engineered dam. Lake Holloman was created in 1965 to receive excess flow from the sewage treatment lagoon system. The lake was created by the construction of a non-engineered earthen dam midway along an existing ephemeral lake (playa) that normally received runoff from areas of HAFB. The source of water for the lake is discharge from the WWTP, groundwater influx, and to a limited extent discharge from the storm water drainage channel. The lake is in a state of dynamic equilibrium, rising and falling with seasonal and annual variations in runoff and sewage generation.

Hydrologic inputs to Lake Holloman include direct precipitation, storm water runoff and treated effluent from the WWTP (estimated to be 0.42 mgd), and inflows of groundwater. Outflows include evaporation and transpiration and seepage/overflow to Lake Stinky in wet years.

Precipitation and Local Storm Water Runoff

As described previously, the drainage area contributing storm water runoff to the wetlands complex encompasses a total of approximately 2,770 acres. This drainage potentially can contribute significant quantities of storm water to Lake Holloman during large, monsoonal storms. Field observations and 1940's aerial photographs indicate that Dillard Draw has in the past carried runoff to the Lake Holloman, however run-off in the past 20 years has infiltrated south of HAFB and not reached the wetlands complex as surface water. Because this source of hydrologic input is variable and not easily quantified, the present water balance assessment conservatively disregards this source of inflow.

Direct precipitation on the lake surface and surrounding wetlands can provide a significant inflow of water. Assuming a rainfall total of 7.9 inches per year on the 150 acres encompassed by Lake Holloman and adjoining wetlands, this inflow may be as much as 31 mgy or 0.09 mgd. As previously noted for Lagoon G, the present water balance assessment for the lake conservatively disregards this inflow component, assuming that precipitation is minimal for an extended period of time.

Evaporation and Transpiration

Evaporation losses from the open-water surface and transpiration losses from vegetated wetlands around the margins of Lake Holloman account for a significant outflow from the lake. Based on a 2004 aerial survey, the area of the present open-water pool is 106 acres and the combined area of open water and wetlands around Lake Holloman encompasses approximately 150 acres. This component of the Lake Holloman water balance assessment is based on the conservative assumptions that transpiration losses are

the same as open-water evaporation losses and that these losses occur at a rate of 5.62 feet per year. For a combined surface area of 150 acres, outflows attributed to evaporation and transpiration are estimated to be 264 mgy or approximately 0.72 mgd.

Groundwater Flows

Lake Holloman is in direct communication with groundwater systems, based on the shallow depth to water and intersection of the water table with the land surface as proven by surrounding monitoring wells. The rate and direction of flow is dependent on the hydraulic gradient established by the altitudes of the lake surface and the surrounding water table. Long-term records show that groundwater generally tends to maintain the lake level in equilibrium with evaporation loss, even with lack of inflow. Excess effluent that is diverted to Lake Holloman from the WWTP may temporarily increase the water level in the lake, may result in an overall higher groundwater level, or may result in overflow or seepage to Lake Stinky. Overall, groundwater influx to Lake Holloman likely balances out any decrease in effluent inflows that may occur.

Change in Lake Storage

Changes in water storage in Lake Holloman take place with rises and declines in the lake level. These changes occur in response to fluctuations in discharge from the WWTP and the storm water drainage channel, precipitation events and local storm water inflows, seasonal temperature changes, and changes in the altitude of the water table. The present water balance assessment conservatively considers these temporal changes to be negligible and assumes that the change in lake storage is zero under current discharge conditions.

Spillway Overflow to Lake Stinky

Surface discharge from Lake Holloman to Lake Stinky at the overflow occurs only in wet years or following extended periods of increased precipitation and storm water runoff. The lagoons and lakes in the system communicate with the high groundwater table in the area. Lake Stinky encompasses as much as 35 acres of playa. This area represents a remnant of the original playa present in the project area prior to the construction of the effluent treatment lagoons and the damming of the playa to create Lake Holloman. Persistent seepage from Lake Holloman is sufficient to maintain a limited surface water expression in Lake Stinky. The present water balance assessment disregards this water-balance component, assuming conservative conditions that occur during extended periods of minimal precipitation and runoff.

3.3 BIOLOGICAL RESOURCES

Biological resources within the project area include native and naturalized or invasive plants and animals and the habitats in which they occur. This section describes plant and animal species or habitat types that typify the biological resources that occur in the wetlands complex hydrologic system. The vegetation on the golf course is not discussed in detail: fairways are planted with hybrid Bermuda grass, greens are planted with bentgrass, and several varieties of shade trees including ash, mulberry, Russian olive, and black locust are found along the golf course.

For purposes of this assessment, sensitive species are plants and animals listed as threatened, endangered, or of concern to the U.S. Fish and Wildlife Service (USFWS), the New Mexico Department of Game and Fish (NMDGF), and the New Mexico Rare Plant Technical Council that designates state-protected species. Previous surveys of the installation (conducted between 2002 and 2006) have indicated that there are no threatened or endangered species present in areas associated with the proposed project.

At least 230 bird species have been confirmed at HAFB, some of which are neotropical migratory birds as well as designated sensitive species. All migratory birds are protected under the 1918 Migratory Bird Treaty Act (16 USC 703), which protects against the taking, killing, possession, transportation, and importation of migratory birds, their eggs, and nests except for authorized permits granted by the Department of Interior. Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, provides details on the responsibilities of Federal agencies in protecting migratory birds. In addition, the Neotropical Migratory Bird Conservation Act (16 USC Chapter 80) was passed in 2000 to (1) perpetuate healthy populations of neotropical migratory birds, (2) assist in the conservation of neotropical migratory birds by supporting conservation initiatives in the United States, Latin America, and the Caribbean, and (3) provide financial resources and foster international cooperation for those initiatives. Federal agencies must also follow the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), which protects these species from illegal taking, killing, possessing, or transporting.

Neotropical migratory birds breed in North America but migrate to Mexico and Central and South America for the winter. It is important to maintain habitat for these species so that migratory patterns are not disrupted. Neotropical migratory birds are of particular interest to wildlife managers for several reasons. First, neotropical migratory birds play a major role in the health and functioning of ecosystems, as consumers of insects, dispersers of seeds, and pollinators of flowers (Robinson 1997). Second, neotropical migratory bird populations have experienced declines throughout the last several decades. Many factors have contributed to these declines including habitat fragmentation and loss, land-use changes in both breeding and wintering habitats (Nicholoff 2003), reductions in migratory stop-over habitat (Robinson 1997), pollution, and increases in predators and nest parasitism. Lastly, neotropical migratory birds can be used by managers as a tool to monitor effects of land-use practices and landscape changes, as well as the health of a particular habitat or system (Hutto and Young 2002).

3.3.1 Existing Conditions

Biota of the project area is typical of the Chihuahuan Desert. Prior to alteration of much of the project area by previous projects, the area was characterized by a mixture of gypsum grasslands and salt-flat grasslands (playas). Construction of the sewage lagoons significantly altered the flow of runoff through this playa system, resulting in the creation of a patchwork of biological habitats including upland grasslands, brackish constructed wetlands, playas, riparian habitats, and surface water features, which are described below. The nature, extent, and persistence of these habitats are highly dependent on the existing discharge of treated effluent from the WWTP, storm water drainage, and groundwater flows at HAFB. The uniqueness of this ecosystem in south-central New Mexico coupled

with its proximity to a north-south bird migration route attracts a large and diverse number of birds to the area for resting, foraging, and nesting.

3.3.2 Vegetation Communities

Upland Grasslands

Upland grasslands within the footprint of the proposed project are limited to the areas around the proposed pipeline and tank location and near some portions of the drainage channel. Small areas of grassland also exist along the upper fringes of Lagoon G and Lake Holloman. Vegetation is generally sparse in this habitat type, especially in the very highly saline soils between Lagoon G and Lake Holloman. Alkali sacaton (*Sporobolus airoides*) is a dominant grass in the gypsum grassland community. Fluffgrass (*Erioneuron pulchellum*), neally dropseed (*Sporobolus nealleyi*), creosote bush (*Larrea tridentata*), tarbush (*Flourensia cernua*), soaptree yucca (*Yucca elata*) and various cacti, including walkingstick cholla (*Opuntia imbricata*) and plains prickly pear (*O. polyacantha*), are widely scattered throughout the gypsum grassland community.

Brackish Constructed Wetlands

Seepage from Lagoon G and the drainage channel has established constructed wetlands along the channel and southwest of Lagoon G in an area that has been altered to promote the establishment and maintenance of these types of wetlands. Water levels in these areas fluctuate seasonally with changes in rainfall, evaporation, and effluent inflow into Lagoon G. These constructed wetlands were created in 1997 as a result of construction of the WWTP and closure of Lagoons A through F.

Much of the lower portion of the marshes is dominated by desert saltgrass (*Distichlis spicata* var. *stricta*), pickleweed brush (*Allenrolfea occidentalis*), and alkaliweed (*Cressa depressa*), with a few scattered Chinese tamarisk (*Tamarix chinesis = T. pentandra*) and patches of alkali sacaton in the higher, drier areas. More limited marsh/wetland areas are found at points along the drainage channel that are not perennially inundated.

Tamarisk (often called salt cedar), a difficult to control non-native plant and state-listed noxious weed, previously dominated some 1,500 acres of these and surrounding areas at HAFB prior to aerial herbicide treatments beginning in 2006. This plant invades areas where groundwater availability is high and over time replaces native vegetation by shading out native plants and consuming large quantities of ground water. Stands of tamarisk generally support lower biodiversity than native species and thus disrupt natural native habitat function. Approximately 200 acres of tamarisk located in the wetland complex were treated from September to October 2006, outside the breeding season for migratory birds that utilize the area.

Playas

The area south of Lake Holloman includes an extensive (35-acre) playa known as Lake Stinky. Playas are depressional areas in the central portions of closed drainage basins that receive surface water flow from surrounding areas. They are comprised of fine-grained sediments, mostly silt and clay, with some sand deposited in thin horizontal layers after heavy rains. Water infiltration is slow in these areas and shallow standing water may remain for several weeks after heavy rains. Playas may contain a higher

diversity of range grasses and shrubs because of the stability of the silt and clay soils. However, playas are subject to additional vegetation losses through soil compaction and salinization.

Lake Stinky represents a remnant of the original playa that was present in the project area. Persistent seepage from Lake Holloman is sufficient to maintain limited surface water at the north end of Lake Stinky, as well as a community of wetland vegetation (saltgrass and sacaton) dominant along the edge of the playa. During most years, discharge to Lake Stinky extends south from the dam through culverts underneath U.S. Highway 70/82 to encompass as much as 26 additional acres.

Riparian Habitat

Riparian areas (e.g., ditches, shorelines) are dominated by a variety of shrubs and a few low stands of trees. Extensive thickets of tamarisk line the ditches and wet areas in the project area. Saltbush and baccharis (*Baccharis pteronioides*) are scattered along the shore around Lagoon G, Lake Holloman, and Lake Stinky. Riparian drainages carved in the sandy-gravelly soils provide habitat for a greater diversity of plant species than adjacent upland areas. Consequently, these habitats support a greater diversity of wildlife species throughout the year. The food and cover provided by vegetation along these long, narrow drainages cross a variety of different habitats.

Wetland vegetation development is limited on the east side of Lake Holloman by relatively steep banks and the significant fluctuations in the lake level. However, along the west edge of the lake, slopes are gentler and a number of pockets of wetland vegetation have formed. These pockets are dominated by tamarisk and saltgrass. The amount of tamarisk has been reduced as a result of the extensive eradication efforts undertaken since 2006.

Surface Water

Surface water in the project area is dominated by Lake Holloman, Lagoon G, and the storm water drainage channel which collectively comprise the wetland complex. Further information about the hydrology of these areas is presented in Section 3.2 above and wildlife species that may be present in these areas is discussed in Section 3.3.4.

Lagoon G supports substantial biological production and represents a significant wildlife habitat resource. Because the sides of this lagoon are relatively steep, the lagoon features limited wetland development along the edges. Lake Holloman is a hypereutrophic, brackish lake whose inflow is primarily controlled by discharge from the WWTP and storm water system and by groundwater inflow. Both Lagoon G and Lake Holloman have rich algal and bacterial growth that support a substantial insect community that in turn attracts considerable numbers of wetland birds to the area throughout the year. These populations are also favored by the presence of marshlands in the low-lying areas of the wetland complex.

Vegetation in the northern portion of the drainage channel is limited to tamarisk and upland grass species; tamarisk growth is thicker south of the lagoon where the channel becomes a perennial surface water feature. In addition to heavy growth of tamarisk, bulrush (*Scirpus maritimus*) is abundant along some portions of the channel. Where the

bank of the channel is somewhat eroded marshlands occur with saltgrass as the dominant species.

3.3.3 Wildlife and Bird Communities

The vegetation communities and open water systems characteristic of the project area provide habitat for a number of wildlife and bird species. Common terrestrial species include the African oryx (*Oryx gazelle*), which is fairly common on the nearby White Sands Missile Range, raccoon (*Procyon lotor*), coyote (*Canis latrans*), black-tailed jackrabbit (*Lepus californicus*), and numerous small rodent species. The wetlands complex hydrologic system supports a number of migratory and resident bird species and HAFB has proactively enhanced the existing desert playa ecosystems in and around the Base to support breeding and migrating bird habitat (HAFB 2000).

Seventy-two percent (344 out of 476) of the bird species that occur in New Mexico are present within or around HAFB (USAF 1995). Species that occur in the uplands surrounding the project area include turkey vulture (*Cathartes aura*), American kestrel (*Falco sparverius*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), mourning dove (*Zenaida macroura*), greater roadrunner (*Geococcyx californianus*), lesser nighthawk (*Chordeiles acutipennis*), horned lark (*Eremophila alpestris*), cactus wren (*Campylorhynchus brunneicapillus*), black-throated sparrow (*Amphispiza bilineata*), western meadowlark (*Sturnella neglecta*), and Scott's oriole (*Icterus parisorum*).

Migratory birds that occur in the area include northern pintail (*Anas acuta*), mallard (*Anas platyrhynchos*), blue-winged teal (*Anas discors*), northern shoveler (*Anas clypeata*), and Wilson's phalarope (*Phalaropus tricolor*). Bird collisions seldom occur at HAFB; the majority of these occur on or near HAFB property within 3,000 feet of ground level on the northern approach. HAFB has procedures in place to limit the number of strikes by avoiding direct flights over the Lake Holloman Wildlife Area.

Wildlife use riparian/arroyo areas as travel lanes (corridors) throughout their range. Neo-tropical shorebirds and songbirds use shoreline and riparian habitats during migration and for nesting and have historically used shoreline and riparian habitats in the wetlands complex for nesting. The American avocet (*Recurvirostra americana*) occurs along the lake shorelines and the green heron (*Butorides virescens*), western kingbird (*Tyrannus verticalis*), and blue grosbeak (*Guiraca caerulea*) occur in the riparian habitat along the drainage channel. Neotropical migrants that have been observed during past surveys include Wilson's warbler (*Wilsonia canadensis*) and several flycatchers (*Empidonax* species).

During a 2004 wetland bird survey, 36 species of wetland birds were observed in the wetland complex. Historically, shorebirds such as American avocet, black-necked stilt (*Himantopus mexicanus*), and snowy plover (*Charadrius alexandrinus*) nested throughout the wetland complex. The number of nests observed in 2004 was down from those observed in surveys performed in 2001 through 2003. These declines in nesting shorebirds are attributed to degradation of nesting habitat due to vegetation encroachment in the wetland complex (Smith and Johnson 2005). Snowy plovers still nest with some frequency at Lake Stinky.

The high productivity of Lake Holloman, together with the insect population of the shoreline, attracts numerous shorebirds and waterfowl to the lake. Mallard, northern shoveler, blue-winged teal, lesser scaup (*Aythya affinis*), ring-necked duck (*Aythya collaris*), and ruddy duck (*Oxyura jamaicensis*) are the duck species which commonly nest in adjacent grasslands. Snowy plover, killdeer (*Charadrius vociferous*), and American avocet are common shorebirds that occur along the shorelines. Black-necked stilt and American avocet were observed breeding at the lake in low numbers throughout the summer of 2004 (Smith and Johnson 2005). A variety of fish-eating species (e.g., black tern, belted kingfisher, and green heron) are also present, presumably attracted by the mosquitofish that are present in the lake (see below). The lake is also used by a large number of migrant Wilson's phalaropes.

Species composition at Lagoon G is generally similar to that noted for Lake Holloman, with the exception that snowy plovers do not use the lagoon and American avocets and black-necked stilts were not observed nesting at the lagoon during the survey conducted in 2004 (Smith and Johnson 2005). However, the American coot (*Fulica americana*) bred at Lagoon G throughout the breeding season and the pied-billed grebe (*Podilymbus podiceps*) and northern shoveler bred there early in the season.

The only aquatic vertebrate found in the project area is the mosquitofish (*Gambusia affinis*), a small (1.5 – 2.5 inches), hardy freshwater fish which primarily feed on insect larvae within the water column and attract several fish-eating species to the area. During warm weather, rich algal blooms fostered by high nutrient levels drive Lake Holloman into anoxic conditions. This routine summer occurrence results in the temporary elimination of mosquitofish from the lake. Because mosquitofish are a persistent feature of the lake it is assumed that the lake is spontaneously restocked from fish populations that persist in the storm water drainage channel or Lagoon G (USAF 1995).

3.4 LAND USE

The Lake Holloman Wildlife Area is an official "Watchable Wildlife" site for New Mexico; as such, the area is of significant interest to the public. As described above in the biological section, a number of wildlife and waterfowl use the wetlands complex, primarily during the migration and breeding season, and the wetlands complex provides the most significant shorebird habitat in the Tularosa Basin. Access by the public for a variety of recreational activities – including bird watching, hiking, and hunting – is permitted to this area off of U.S. Highway 70/82; several parking areas are provided along Lake Stinky and Lake Holloman, and foot traffic is permitted along the storm water drainage channel and Lagoon G. Seasonal feeding, nesting, and migratory patterns of birds can be disrupted by human activities and some seasonal access restrictions to the wetlands are in place.

4.0 ENVIRONMENTAL CONSEQUENCES

This section presents the environmental consequences that would result from implementation of the three alternatives described in Section 2. For each alternative, the environmental effects are analyzed for the resource topics (water resources, biological resources, land use) presented in Section 3. An environmental consequence or impact is defined as a modification in the existing environment brought about by implementation of an action.

Impacts can be beneficial or adverse, direct or indirect, or cumulative. Beneficial impacts are those that involve a positive change in the condition or appearance of a resource or a change that moves the resource toward a desired condition. Adverse impacts involve a change that moves the resource away from a desired condition or detracts from its condition. Direct impacts are caused by an action and occur at the same time and place as the action. Indirect impacts are caused by an action and occur later or farther away from the resource but are still reasonably foreseeable. Cumulative impacts are the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

Impacts can also be permanent or long-lasting or temporary or of short duration. Short-term impacts would occur during and immediately after construction of the proposed project and would primarily be associated with the pipeline location and tank placement. Contract specifications would limit construction equipment maneuvering to a narrow alignment immediately adjacent to the proposed pipeline and tank location. The following analysis of the potential impacts to floodplains and wetlands within the project area support a FONPA.

4.1 WATER RESOURCES

Potential impacts to water resources, described in Section 3.2, were assessed to include both short-term effects from construction activity and long-term effects from changes in water flows and storage levels in the system. A simplified hydrologic model, shown as Figure 8 above, was run to examine the effects of diverting a portion of the WWTP effluent to the golf course. The results of this analysis focus primarily on impacts to the flows and storage levels of the wetland complex hydrologic system.

4.1.1 Potential Impacts of the Proposed Action Alternative

Impacts to hydrological resources are of two primary types: short-term impacts that would occur during construction activities and long-term impacts that would occur as a result of effluent diversion. Construction equipment would be necessary to implement the Proposed Action alternative. This would include excavation for the pipeline that would divert water from the WWTP effluent line to the storage tank and from the storage tank to the golf course irrigation pump house – a total distance of approximately 500 feet – and heavy equipment construction that would be necessary for placement of the water storage tank and its pad. All of the proposed construction activities would be confined to a less than 1-acre parcel north of Lagoon G.

Impacts to surface waters in the area would be from potential spills of fluids, fuels, and other lubricants used in the construction equipment and from potential erosion of surface soil sediments from the construction site. The potential for spills, while small, still exists

and contamination of surface waters could occur if spills are not cleaned up and disposed of properly. Compliance with the State of New Mexico Ground and Surface Water Quality Protection Regulations (New Mexico Administrative Code, Title 20 Environmental Protection, Chapter 6 Water Quality) would apply to the construction permit and would direct action related to any spills that occurred during construction. Therefore, no impacts to surface or ground waters are anticipated from accidental spills. All disturbed areas would be stabilized by recontouring and revegetating as necessary following construction. Therefore no impacts to water quality are expected from construction activities.

Following construction, this alternative would divert 70 to 130 mgy of effluent from the WWTP to irrigate the HAFB golf course. The impact of these diversions on the various components of the wetlands complex is shown in Table 2 and discussed in the following sections.

Table 2. Magnitude of present and projected water balance components of the wetlands complex under the three alternatives.

Lagoon G	Inflow from WWTP (mgd)	Precipitation and Storm Water Runoff[a]	Evaporation/ Transpiration (mgd)	Groundwater flows (mgd)	Outflow to the Discharge Channel (mgd)
Current conditions	+0.28	0	-0.25	-0.02	-0.01
35 mgy diversion	+0.28	0	-0.25	-0.02	-0.01
70 mgy diversion	+0.28	0	-0.25	-0.02	-0.01
130 mgy diversion	+0.28	0	-0.25	-0.02	-0.01

Discharge Channel	Inflow from Lagoon G (mgd)	Precipitation and Storm Water Runoff[a]	Evaporation/ Transpiration (mgd)	Groundwater flows (mgd)	Outflow to Lake Holloman (mgd)
Current conditions	+0.01	0	-0.01	0	0
35 mgy diversion	+0.01	0	-0.01	0	0
70 mgy diversion	+0.01	0	-0.01	0	0
130 mgy diversion	+0.01	0	-0.01	0	0

Lake Holloman	Inflow from WWTP (mgd)	Precipitation and Storm Water Runoff[a]	Evaporation/ Transpiration (mgd)	Groundwater flows[b] (mgd)	Lake Holloman water balance (mgd)
Current conditions	+0.42	0	-0.72	+0.30	0
35 mgy diversion	+0.32	0	-0.72	+0.40	0
70 mgy diversion	+0.23	0	-0.72	+0.49	0
130 mgy diversion	+0.06	0	-0.72	+0.66	0

[a]Precipitation and Storm Water Runoff are conservatively estimated to be zero. Inputs from either of these would increase storage and flow in the wetlands complex.

[b]As described in Section 3, Lake Holloman lies within the water table and groundwater generally tends to maintain the lake level in equilibrium with evaporation loss, even with lack of inflow.

Treated effluent flowing from the WWTP currently averages about 255 mgy, although there are years that may be higher or lower. This effluent flows into Lake Holloman and Lagoon G at the rate of approximately 0.70 mgd. Under the Proposed Action alternative, this flow would be reduced to 0.51 mgd under the 70 mgy diversion or to 0.34 mgd under the 130 mgy diversion. As described in Section 3, potential input of water into Lagoon G from storm water runoff and direct precipitation is held to zero in this model, resulting in a conservative water balance estimate. Water levels in Lagoon G would be maintained seasonally by inputs from the WWTP.

Outflows to the discharge channel that connects Lagoon G to Lake Holloman would be low (0.01 mgd) and these inputs would be offset by evaporation and transpiration along the channel. Low evapo-transpiration is expected along the discharge channel, especially as tamarisk treatments continue to take place. Groundwater inflows or outflows along the channel are expected to be minimal under this and all alternatives and in this water balance model were held to zero. In years of high precipitation, groundwater inflows may be significant enough to contribute to Lake Holloman's water balance.

Because of the size of Lake Holloman (roughly 150 acres), evaporative losses are high. The decreased water flow into Lake Holloman as a result of effluent diversion under the Proposed Action alternative coupled with high evaporative losses would result in a net deficit water balance in Lake Holloman, if groundwater inflows are not taken into account. Assuming that 0.28 mgy of effluent would be necessary to maintain the water levels in Lagoon G, a 70 mgy effluent diversion for golf course irrigation would result in a decrease of 0.19 mgd of effluent flowing to Lake Holloman; under a 130 mgy diversion, effluent flowing to the lake would decrease by 0.36 mgd. Under the Proposed Action alternative, it is assumed that groundwater inflows would need to increase into Lake Holloman from 0.30 mgd to 0.49 mgd or 0.66 mgd under the respective 70 and 130 mgy diversion scenarios.

Because Lake Holloman lies within the water table, compensatory inflow from groundwater is a reasonable assumption. Past studies have indicated that the water level in the lake is largely independent of effluent inflow and much more closely tied to groundwater levels. Because of the prolonged drought in the region, evaporation rates have been severe, temperatures and wind speeds have been high, and humidity has been low compared to the long-term average. Collectively these factors have resulted in an overall lowering of the water table in the region and a concomitant decrease in the water level in Lake Holloman. However this decrease appears to be largely independent of any reduction in effluent inflow to the lake resulting from a decreasing Base population and water conservation measures discussed above.

These projections represent a "worst-case scenario" and assume that the HAFB population remains constant (therefore no increase in water use), that precipitation is minimal with no storm water runoff occurring, and that the effluent flow from the WWTP is approximately equal to that measured in 2007 (~255 mgy). As recently as 2005, effluent from the WWTP was as high as 307 mgy, and the annual effluent flow from 2000 to 2006 averaged 329 mgy. Also, as discussed previously, precipitation inputs were held to zero for purposes of this hydrologic model. On average HAFB receives 7.9

inches of precipitation annually which could contribute up to 41 mgy to the wetlands complex.

Impacts of applying effluent water to the golf course are not the primary focus of this analysis and have been adequately described in the *Holloman Air Force Base Golf Course Wastewater Irrigation Feasibility Study* (Foster Wheeler 2003). One of the obstacles summarized in that document has to do with the salinity of the water used for irrigation. As noted earlier, soils in the project area tend to be highly saline and current research indicates that flushing of salts will generally not work on Tularosa basin soils without major modifications to the soil and sub-soil. Furthermore, irrigation water is generally not of sufficient quantity to completely flush the salts from the soil column.

About 70 mgy of potable water are currently used to irrigate the golf course. The USGA has established guidelines for salinity of irrigation water used on golf courses. The potable water supplies currently used to irrigate the golf course meet this guideline but the salinity of HAFB's treated effluent is 2.5 times the recommended amount and total dissolved solids (TDS) of the effluent is 2.5 times the 1,000 mg/L TDS guideline (2500 TDS as measured by conductivity). Therefore, even though additional water may be available for irrigation by implementing the Proposed Action alternative, the use of reclaimed effluent without modifications to the soil and/or changes in the composition of golf course vegetation may increase the soil salinity further deteriorating vegetation on the golf course. Revegetating the golf course with salt tolerant species is an ongoing project to assure healthy fairways. The project is being voluntarily undertaken by the golf course management. Actions to reduce the salinity problem are further discussed in the *Holloman Air Force Base Golf Course Wastewater Irrigation Feasibility Study* (Foster Wheeler 2003).

4.1.2 Potential Impacts of the No Action Alternative

Under the No Action alternative, no effluent would be diverted from the WWTP for use on the golf course and effluent flowing into the wetlands complex would remain the same. Therefore no change in water levels or hydrological functioning from that observed under current conditions would be anticipated. Approximately 70 mgy of potable water would continue to be used to irrigate the golf course at HAFB.

4.1.3 Potential Impacts of Alternative C

This alternative would divert approximately 35 mgy of effluent from the WWTP to the golf course leaving approximately 220 mgy of effluent flowing into Lake Holloman and Lagoon G. The effects of implementing this alternative are similar to the Proposed Action alternative in that the amount of construction disturbance that would be required would be the same under both alternatives.

However, the impact on the hydrologic balance of the wetlands complex would be less. Under this alternative a diversion of 35 mgy of effluent would result in a decreased flow of effluent to Lake Holloman (from 0.42 mgd to 0.32 mgd), although this would be smaller than the Proposed Action alternative. A decrease of effluent flow to Lake Holloman of 0.10 mgd would result from this alternative, but would be compensated by an increase in groundwater inflows of 0.10 mgd.

Salinity levels of the effluent would still be a problem for the golf course even if the wastewater was blended with potable water at a 1:1 ratio. Therefore leaching and impacts to vegetation on the golf course would still be a problem, although to a lesser degree than under the Proposed Action alternative.

4.2 BIOLOGICAL RESOURCES

Potential impacts to biological resources, described in Section 3.3, were assessed including both short-term effects of construction activity and long-term effects on habitat from changes in the water levels in the system.

4.2.1 Potential Impacts of the Proposed Action Alternative

Vegetation

Short-term direct impacts to vegetation resources would occur in the area of disturbance for the pipeline and tank placement, an area of less than 1 acre. Language included in the construction contract would specify the limit of permissible ground disturbance allowed during new pipeline and tank installation and heavy equipment and other construction vehicles would not be allowed in areas beyond this narrow limit. BMPs would be implemented to protect vegetation resources present on the site and the area would be reclaimed after installation is complete. These impacts are anticipated to be temporary along the pipeline location and long term at the tank installation site. There is little vegetation present in this area and therefore negligible direct impacts to vegetation are anticipated from this alternative. The potential for the spread of noxious weeds and/or invasive species may be increased with ground disturbance. However typical noxious weed control efforts practiced by HAFB in conjunction with construction projects would minimize the potential for spread.

Indirect effects to vegetation could occur from a reduction in the amount of treated effluent flowing into the wetlands complex. Under this alternative, there would be a reduction of 70 to 130 mgy of inflow to the system. The levels in Lagoon G would be maintained and therefore wetland vegetation in this location would not be affected. Seasonal reductions in water levels could occur, however, depending on how much water is diverted to Lake Holloman versus Lagoon G. In general, water would be directed to Lagoon G and the wetlands to provide waterfowl habitat during the migration season (late fall, winter, and early spring). During late spring, summer, and early fall water would be diverted for use at the golf course although sufficient water would flow to Lagoon G to keep it wet and preserve the mudflats that are important to shorebird. Any excess water would continue to flow to Lake Holloman. Under this alternative there would be a decrease in effluent flow to Lake Holloman that could affect vegetation at that location; however, compensatory groundwater inflows discussed in Section 4.1 above would likely result in no significant change in water levels and thus no lasting impact on vegetation.

Irrigation of the golf course with treated effluent would compound the issue of soil salinity levels. The salinity of HAFB's effluent is 2.5 times the salinity of the potable water irrigation supplies. Consequently the golf course is currently introducing a variety of salt tolerant species to assess their survival under these saline conditions. The use of effluent may further deteriorate the fairway turf; thus effluent may be better suited for

irrigation of rough areas. Changes to the irrigation system may also be needed under this alternative (e.g., directional sprinkler heads, drainage improvements, salt- and drought-tolerant landscaping plants) to maintain the viability of the golf course.

Wildlife

An insignificant amount of upland vegetation, and thus wildlife habitat, is present and would be directly impacted as a result of the Proposed Action alternative. Individual animals may be temporarily displaced by noise and other activity related to construction of the new pipeline and tank installation, but these effects would be short-term and localized lasting only for the duration of the project (approximately 30 days).

By maintaining the water levels in Lagoon G and the wetlands complex, this alternative would indirectly protect the wetland and riparian habitats in these locations. The protection of these resources would protect habitat for migratory waterfowl, shore birds and other species associated with these habitat types. Although the water levels in Lagoon G would be maintained, the reduction in flow to Lake Holloman could affect wetland and riparian vegetation and habitat in those locations, although compensatory groundwater flows are expected to minimize this impact.

4.2.2 Potential Impacts of the No Action Alternative

Vegetation

The No Action alternative provides a baseline condition from which to evaluate the potential consequences of not changing the irrigation source of water for the golf course. This "no change" scenario would maintain the flow of all treated effluent into the wetland complex, while continuing irrigation of the golf course with potable water. The pipeline and tank proposed to connect the existing effluent discharge pipe to the golf course would not be installed and there would be no new ground disturbance. There would be no effects on vegetation in the wetlands complex.

The HAFB golf course would continue to be irrigated with potable water. The potable water source currently meets the maximum salinity USGA water quality guidelines for salinity but, because the golf course is located in low land with poor drainage and a shallow water table, salts concentration in some areas is high. The current irrigation water quality and rate has proven inadequate to flush accumulated salts from the soils underlying the grassland areas. Recent work by New Mexico State University (on file at HAFB) indicates that with desert soils such as those found at the HAFB golf course , high rate irrigation actually can cause upward wicking of dissolved solids from the water table. Therefore, changes in application rates and sprinkler patterns would still be needed under this alternative (e.g., directional sprinkler heads, drainage improvements, salt- and drought-tolerant landscaping plants) to maintain the viability of the golf course. The golf course would continue to experiment with planting of various salt-tolerant species to identify which species best survive under the saline conditions of the area.

Wildlife

There would be no change to the existing ecosystem under this alternative and therefore no impacts to wildlife or migratory birds would be expected.

4.2.3 Potential Impacts of Alternative C

Vegetation

Direct impacts to vegetation resources would be the same as those described for the Proposed Action alternative because the amount and location of ground disturbance would be the same. Indirect effects would also be similar but the extent would be reduced compared to the Proposed Action alternative. The primary difference between the alternatives is related to the amount of effluent that would be used on the golf course; under this alternative, there would be a reduction of 35 mgy of inflow to the system. The water levels in Lagoon G would be maintained and therefore wetland vegetation in this location would not be affected. However, there would be a 0.10 mgd decrease in effluent flow to Lake Holloman which could affect wetland vegetation in those locations, although ground water inflow is expected to minimize this affect.

Wildlife

Direct impacts to wildlife under this alternative would be the same as those described for the Proposed Action alternative because the amount and location of ground disturbance would be the same. Indirect effects would also be similar but the extent would be reduced compared to the Proposed Action alternative. This alternative would divert approximately 35 mgy of effluent to the golf course and approximately 220 mgy of treated effluent would continue to be discharged to the wetlands complex.

4.3 LAND USE

Potential impacts to land use, described in Section 3.4, were assessed including both short-term effects of construction activity and long-term effects on habitat from changes in the water levels in the system.

4.3.1 Potential Impacts of the Proposed Action Alternative

As described in Sections 4.1 and 4.2, no long-term changes are anticipated in water levels or biological resources as a result of the proposed water diversions. Therefore, recreational use of the wetlands complex for bird watching, hiking, and hunting is not expected to be affected.

4.3.2 Potential Impacts of the No Action Alternative

Under the No Action alternative, no changes would occur and the wetlands complex would remain a "Watchable Wildlife" site and be available for various recreations pursuits.

4.3.3 Potential Impacts of Alternative C

The impact of Alternative C on land use at the Lake Holloman Wildlife Area would be the same as the Proposed Action alternative.

4.4 CUMULATIVE EFFECTS

Cumulative effects on environmental resources result from incremental impacts of an action, when combined with other past, present, and reasonably foreseeable future projects in the area. Cumulative effects may arise from single or multiple actions and may result in additive or interactive effects (CEQ 1997b). Cumulative effects can result

from minor, but collectively substantial actions undertaken over a period of time by various agencies (federal, state, and local) or individuals.

In accordance with NEPA, past, present, and reasonably foreseeable future actions with the potential to cumulatively affect the same resources as the alternatives presented in Section 2 are discussed below followed by an analysis of cumulative effects. Future actions proposed in the area may require site-specific NEPA analysis prior to implementation.

4.4.1 Past, Present, and Reasonably Foreseeable Actions

Past disturbance in the immediate project area is related to construction of the lagoons and the pipeline carrying treated effluent from the WWTP. Recent projects in the immediate area have consisted of tamarisk removal treatments that occurred in the constructed wetland complex beginning in September 2006. This invasive species was aerially treated with herbicide using a helicopter. The purpose of treating the area was to reduce the amount of ground water consumed by tamarisk and to return native habitat condition and function to the area.

In addition to the activities described above, activities have occurred in other locations on HAFB that have affected the flow of treated effluent entering the wetlands complex. The flow of treated effluent has declined in recent years due to reductions in the population at HAFB, a reduction in the number of active housing units on the Base, as well as by sewer line remediation. The population at HAFB has decreased with mission change at the Base, but is expected to recover and possibly expand. A number of housing units have also been taken out of active use and are being rehabilitated prior to potential future use. A significant portion of the Base's sewer system has also been rehabilitated to minimize groundwater infiltration. The wastewater in the rehabilitated sewer lines has less salinity than the water in unrehabilitated lines indicating that the rehabilitation was effective and is contributing to the observed reduction in the flow and salinity of wastewater to the WWTP.

Although those actions resulted in a decrease in flow into the WWTP, other actions are likely in the future that could increase the amount of treated effluent available for discharge to the wetlands complex. The mission of HAFB is certain to be expanded in the future which would result in an increase in Base population. Increased water use at HAFB would be expected to result in an increase of wastewater to the WWTP with a concomitant increase in outflow of treated effluent. It is anticipated that approximately 400 housing units will be reactivated in the future for a total of 909 units. These units will impose a lower per unit load on the WWTP than they would have in the past because the rehabilitated units will have modern flow-limiting and low-flush volume fixtures. The additional flow when these rehabilitated housing units are reactivated is conservatively estimated to be 142,000 gpd or 350 gpd per unit. As the population increases, additional housing units may be required beyond the 909 currently projected. These increases would have the net effect of increasing effluent releases from the WWTP and thus increasing inflow into the wetland complex.

Other actions could occur that would decrease the amount of water – either potable water or treated effluent – needed for irrigation of the golf course. The *Golf Course Wastewater Irrigation Feasibility Study* (Foster Wheeler 2003) recommended

improvements to the existing irrigation system that could be used to reduce the amount of water used. The analysis reported that the existing system over-irrigated the center portion of the fairways and did not adequately water the fairway fringes and the rough. It was recommended that 180-degree heads be installed on the fairways in place of the 360-degree heads to save water and drip or bubbler irrigation was recommended for the rough and landscaped areas. It was anticipated that these changes would reduce the amount of water needed by up to 50 percent.

Other recommendations were also made to reduce the amount of water used for irrigation of the golf course. These recommendations included replacing some of the non-essential fairway turf with drought-tolerant plants and planting salt tolerant plant species, such as paspalum, in areas where the groundwater table is shallow and no irrigation from the main system occurs. Raising the elevation of the ground surface in shallow water table areas of the golf course was also proposed to improve soil drainage. Some of these actions – such as planting salt-tolerant species – are already underway and other actions, if implemented, would reduce the amount of water required for irrigation of the golf course.

4.4.2 Analysis of Cumulative Effects

Past actions at HAFB have had the effect of reducing the amount of potable water used at the Base. While these measures have been beneficial in that aspect, they have reduced inflow of water to the wetlands complex. The Proposed Action would further reduce effluent inflow by 70-130 mgy and Alternative C would reduce inflow by 35 mgy. Some of the proposed actions for saving potable water, such as installing low flow fixtures and implementing water conservation measures at the golf course, would result in potable water savings that would be additive with other water-saving measures under the alternatives. However, these too could ultimately result in less flow of water into the groundwater surrounding the wetlands complex and less flow of water into the WWTP.

Other future actions described above would increase the flow of wastewater into the WWTP and thus inflow to the wetlands complex. This includes an increase in housing occupancy as the population at HAFB increases. Tamarisk treatments are also expected to have positive effects on the water levels in the wetlands complex by increasing the amount of groundwater available for the system. This action will also have the benefit of restoring natural habitat and biodiversity. Actions that would increase inflow to the wetlands complex would offset some of the losses from using this water source for golf course irrigation.

4.4.3 Irreversible and Irretrievable Commitment of Resources

The analysis in this document used the best available information to estimate environmental impacts; conservative assumptions were made to estimate effects where information was unavailable. Unavoidable adverse effects are disclosed where they are anticipated. HAFB would follow accepted conservation and mitigation measures to minimize potential effects to resources. Energy requirements and conservation measures would not be affected.

Any irretrievable and irreversible commitments of resources that are associated with each alternative are summarized here. An irreversible commitment of resources is defined as

the loss of future options. The term applies primarily to the effects of using nonrenewable resources, such as minerals or cultural resources, or to the loss of an experience as an indirect effect of a permanent change in the nature or character of the land. Irreversible commitments are those that cannot be reversed, except perhaps in the extreme long term.

An irretrievable commitment of resources is defined as the loss of production, harvest, or use of natural resources. Irretrievable commitments are those that are lost for a period of time. The amount of production foregone is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume production.

Irretrievably and irreversibly committed resources are those that are consumed during the construction and implementation of a project and that cannot be reused. Because their reuse is impossible, they are considered irretrievably and irreversibly committed to the development of the proposed project. These resources would include expendable materials necessary for construction, as well as fuels and other forms of energy that are utilized during project implementation.

During construction activities associated with the Proposed Action and Alternative C, non-renewable resources would be consumed. Because the reuse of these resources may not be possible, they could be considered irreversibly and irretrievably committed should the actions be implemented. Fossil fuels, labor, and construction materials would be expended in the project; these are generally not retrievable. Expenditure of public funds, which are not retrievable, would also be required. Soils and vegetation would be disturbed during construction but the effects would be temporary; it would be possible to rehabilitate impacted areas and return them to their preconstruction state.

4.4.4 Relationship of Short-Term Uses and Long-Term Productivity

The short-term use of resources and impacts of construction are consistent with the maintenance and enhancement of long-term productivity for the area.

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LIST OF PREPARERS

A list of HAFB and contract personnel involved in the preparation of this EA is included as Table 3.

Table 3. Individuals Involved in the Preparation of the EA.

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David Griffin	Environmental Engineer, Water Quality Manager 49 CES/CEV HAFB
Deborah Hartell	Flight Chief 49 CES/CEV HAFB
Mike Jago	NEPA Specialist, HAFB Project Manager, 49 CES/CEV HAFB
Brennon Orr	Hydrologist, North Wind, Inc.
Scott Webster	Biologist, North Wind, Inc.
Tom Zink	Government Project Manager, U.S. Army Corps of Engineers, Omaha District

ACRONYMS

BMP	Best Management Practice
CEQ	Council on Environmental Quality
CWA	Clean Water Act
DoD	Department of Defense
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESCP	Erosion and Sediment Control Plan
FONSI	Finding of No Significant Impact
FONPA	Finding of No Practicable Alternative
HAFB	Holloman Air Force Base
IICEP	Interagency and Intergovernmental Coordination for Environmental Planning
mgd	million gallons per day
mgy	million gallons per year
MWR	Morale, Welfare, and Recreation
NEPA	National Environmental Policy Act
NMED	New Mexico Environment Department
NMDGF	New Mexico Department of Game and Fish
NPDES	National Pollutant Discharge Elimination System
SCADA	Supervisory Control and Data Acquisition
SWPPP	Storm Water Pollution Prevention Plan
TDS	Total Dissolved Solids
USAF	United States Air Force
USFWS	United States Fish and Wildlife Service
USGA	United States Golf Association
WWTP	Wastewater Treatment Plant

APPENDIX A – IICEP Letter

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH FIGHTER WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

MEMORANDUM FOR DISTRIBUTION

FROM: 49 FW/CC
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

SUBJECT: Golf Course Effluent Irrigation Environmental Assessment

The United States Air Force at Holloman Air Force Base (HAFB) has prepared a Draft Environmental Assessment (EA) to evaluate the potential impacts of substituting potable water with treated effluent from the Waste Water Treatment Plant at HAFB for irrigation of the golf course.

The Draft EA is available for review at the Alamogordo Public Library at 920 Oregon Avenue and the HAFB Library, Building 224 at 596 Fourth Street or you may request a copy of the Draft EA from HAFB Public Affairs at 505-572-5406 or by writing to the address below. We are interested in any comments that you may have; please review the EA and provide us with your comments within 30 days from the date of this letter. Comments regarding the EA may be directed to Mr. Wesley Westphal at 505-572-5040 or 49 CES/CEV, Building 55, 550 Tabosa Avenue, HAFB, NM 88330. No response will be considered as agreement.

Thank you for your assistance in this matter.

A. David Budak

Deputy Base Civil Engineer

Distribution List for the HAFB Golf Course Effluent Draft EA

Gedi Cibas
Environmental Impact Review Coordinator
New Mexico Environmental Department
1190 St Francis Drive
Santa Fe, NM 87502

Lisa Kirkpatrick
Conservation Services Division
New Mexico Department of Game and Fish
PO Box 25112
Santa Fe, NM 87504

Benjamin N. Tuggle
Acting Southwest Regional Director
Ecological Services Field Office
2105 Osuna Road, NE
Albuquerque, NM 87113

Charles Webster
Bureau of Land Management
Public Contact Representative
Las Cruces District Office
1800 Marquess St.
Las Cruces, NM 8805

Katherine Slick, Director
Department of Cultural Affairs
Historic Preservation Division
228 East Palace Ave. Room 320
Santa Fe, NM 87501

Jacque Buchanan
Forest Supervisor (acting)
Lincoln National Forest
3463 Las Palomas Rd.
Alamogordo, New Mexico 88310

Dora Padilla, Director
Resource Management & Protection
Mescalero Apache Tribe
P.O. Box 227
Mescalero, NM 88340

Superintendent
White Sands National Monument
P.O. Box 1086
Holloman AFB
New Mexico 88330

R. Borunda
Desert Lakes Golf Course Manager
2351 Hamilton Rd
Alamogordo, NM 88310

ATTN: NEPA
WSMR-DPW-E-Customer Support
219 Rossford Avenue
WSMR, NM 88002

Ray Backstrom
Otero County Administrator
1000 New York Avenue, Rm 101
Alamogordo NM 88310

Doug Moore
Otero County Commission
1000 New York Avenue, Rm 101
Alamogordo NM 8831

Toots Green
Committee of Fifty
1019 Canyon Road
Alamogordo, NM 88310

Bill Burt
Committee of Fifty
8 Ridge Lane
Alamogordo, NM 88310

Pat McCourt
City Manager
1376 E. Ninth St
Alamogordo, New Mexico 88310

Steve Brocket
Mayor, City of Alamogordo
1376 E. Ninth St
Alamogordo, New Mexico 88310

Anita Powell
President, Lincoln County Bird Club
100 Mountain View Drive
Ruidoso, NM 88345

Gill M. Sorg
President, Mesilla Valley Audubon Society
PO Box 1645
Las Cruces, NM 88004

The EA was made available to the public at the following locations:

Alamogordo Public Library
920 Oregon
Alamogordo NM 88310

NMSU-A Library
2400 Scenic Dr.
Alamogordo NM 88310

Otero County Clerk's Office
1000 N. New York
Alamogordo, NM 88310

HAFB Base Library
Bld 244
Holloman AFB, NM 88330

APPENDIX B – Notice of EA Availability

Interested parties are hereby notified that the United States Air Force, Holloman Air Force Base (HAFB), New Mexico has completed a Draft Environmental Assessment (EA) that resulted in a Finding of No Significant Impact (FONSI) for the Golf Course Effluent Irrigation Project. The EA documents the proposed actions for the project – substituting potable water with treated effluent from the Waste Water Treatment Plant to irrigate the golf course, alternatives to the proposed action, the affected environment, and impacts to the affected environment. Information regarding the project may be found in the EA and FONSI available for review at the Alamogordo Public Library at 920 Oregon Avenue, and the HAFB Library, Building 224 at 596 Fourth Street; or you may request a copy of the Draft EA from HAFB Public Affairs at 505-572-5406 or by writing to the address below. Comments regarding the EA and FONSI may be submitted for 30 days to Mr. Wesley Westphal at 505-572-5040 or to 49 CES/CEV, Building 55, 550 Tabosa Avenue, HAFB, NM 88330. All written comments received during the comment period will be made available to the public and considered during Final EA preparation.

APPENDIX C – Environmental Elements Considered But Eliminated From Detailed Analysis

Environmental Justice: Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* issued on February 11, 1994, mandates federal agencies to assess whether their actions have disproportionate environmental and human health impacts on minority and low-income populations. The intent of this order is to ensure that all communities, including minority, low-income, or federally recognized tribes, live in a safe and healthful environment. Lands within HAFB do not contain any tribal lands or low-income properties. The change in the use of effluent water would not cause any disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, or Indian Tribes.

Cultural Resources: No cultural resources are known to occur in the areas with the potential to be affected by the proposed action or alternatives. Consultation with the Base archaeologist would occur for all ground disturbance associated with the alternatives to ensure no impacts to sites would occur. Therefore, no impacts to archaeological, cultural, or historical resources are anticipated from implementation of the proposed action or alternatives.

Air Quality: Air emissions from construction activities under the proposed action and alternatives would be similar to those produced during typical light-construction activities. Light-duty and heavy-duty trucks would be used to deliver new pipeline materials to specific installation areas and move soil within the project area. During construction short-term adverse effects on air quality may result from dust and exhaust emissions. Fugitive dust from equipment travel and activity would be produced, from movement of small numbers of contractor vehicles during construction activity.

Particulate matter emanating from construction activities would be controlled in accordance with applicable NMED regulations. The installation of the pipeline and tank would temporarily result increase fugitive dust related to ground disturbance. Construction practices and BMPs would be implemented to mitigate negative impacts associated with fugitive dust. Topography and meteorology of the area in which the project is located would not restrict dispersion of the air pollutants. Impacts to air quality would be localized, short term, and negligible.

Noise: Noise would be generated by construction activities, although typical equipment to be used would not produce greater noise volumes than other activities typical for the area. Noise would be generated intermittently from the work site during normal working hours until completion and would be greater than normal at times. Construction work would occur during daylight hours when loud noises are more tolerable. After completion, noise levels would consist of background noise from existing use and normal vehicle traffic. Therefore, the construction activities associated with the proposed action or alternatives would result in a negligible, short-term, localized increase in noise levels on HAFB. This would not be noticeable in the context of other activities that are occurring on the Base.

Safety: Construction to implement the proposed action and alternatives would present common construction hazards and impacts; therefore, the types of safety risks associated with implementation of the alternatives are those that are commonly related to construction projects. All construction work on the site would occur within the guidelines of relevant procedures and controls to ensure that appropriate industrial safety precautions are followed to prevent accidents and injuries. Safety standards and procedures for day-to-day operations at HAFB are found in USAF regulations; additional guidance concerning safety issues can be found in the DoD Directive 1000.3, Safety and Occupational Health Policy for the DoD, March 29, 1979. Impacts would be short term and temporary, occurring only for the duration of the construction period. Once construction is complete no effects to public or personnel safety are expected. Maintaining the water levels in Lagoon G will ensure that contaminated soils remain covered thereby eliminating the risk of airborne particulates.

Hazardous Materials and Waste Management: There are no hazardous materials or wastes known to occur within the project area. No hazardous waste would be generated by the alternatives and solid waste facilities would not be impacted. No short- or long-term impacts are expected from the proposed action or alternatives.

Soil Resources: Activities related to excavation and installation of the new pipeline would result in less than 1 acre of ground disturbance. Applicable construction BMPs would be implemented to reduce the potential for impacts; all disturbed soils would be returned to their original (or improved) condition as part of the process. Therefore, impacts to soils are expected to be short-term, localized, and negligible.

Infrastructure: The proposed action and alternatives would result in negligible change to infrastructure of the Base. The tank that would be used for storage of irrigation water is already on the Base and would be relocated to the project area but would not add infrastructure to that which already exists. A new section of pipeline would be added to supply water to the irrigation pumping well used to water the golf course. This would be a negligible increase in the Base's infrastructure.

Visual Resources: In general, the degree to which an action would modify the existing surroundings is used to assess the level of impact to visual resources. The proposed action or alternatives would not alter or change the visual characteristics associated with activities occurring on the Base. Construction equipment would be visible in this area during project implementation but it would not obstruct views of the surrounding area nor would it significantly change the overall landscape. After construction, pressure relief valves may be visible; however, these types of features are common in developed areas and are not expected to detract from the visual resources of the area. There would be no long-term impacts to visual resources.

Socioeconomics: The proposed construction activity would generate a small number of direct construction-related jobs for the duration of the project. During the construction phase of the project a temporary increase in economic activity would result from purchases of supplies and services from local contractors. Most of the work would be sourced to a local contractor through a competitive bid process. The regional construction industry could accommodate the proposed project, since proposed construction would represent a continuation of the economic activity generated in the

region by HAFB. This is not expected to increase the workforce and no new positions would be created during the construction phase. The cost of construction is considered insignificant compared to the overall construction/maintenance budget for HAFB. Long term savings of potable water is expected to be significant as golf course watering is the largest single water user. No significant short or long term impacts are expected to socioeconomic resources from implementation of the proposed action or alternatives.

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH FIGHTER WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

0 5 MAR 2009

MEMORANDUM FOR 49 FW/CC

FROM: 49 CES/CC

SUBJECT: Question regarding usage of Lake Holloman versus Raptor Lake in Environmental Assessment of Effluent Irrigation of the Golf Course, Holloman Air Force Base, New Mexico

1. All environmental documentation/reviews are legal documents, open to the general public, and subject to Federal and State laws and regulations. As such, the language utilized in the documents must pertain to legally recognizable terms and language.

2. Lake Holloman is the United States Geological Service name for the body of water located on the Southwest quadrant of Holloman Air Force Base, and is entered in the Library of Congress as the Playa's legal name. Raptor Lake is a local name, not the legal name for the body of water, hence the use of the name Lake Holloman in environmental documentation.

3. If you need any additional information, my point of contact is Wesley Westphal, 49 CES/CEAO, 572-6678, or e-mail at Wesley.westphal@holloman.af.mil

MICHAEL L. MYERS, Lt Col, USAF
Commander, 49th Civil Engineer Squadron

Westphal, Wesley J II Civ USAF ACC 49 CES/CEAO

From:	Brupbacher, Emil D Civ USAF ACC 49 FW/JAI
Sent:	Wednesday, October 29, 2008 10:22 AM
To:	Westphal, Wesley J II Civ USAF ACC 49 CES/CEAO
Cc:	Hartell, Deborah J Civ USAF ACC 49 CES/CEA
Subject:	RE: Golf Course Effluent Irrigation EA

Wesley

I reviewed the EA and it is legally sufficient.

Sorry again for the delay.

Emil

EMIL D. BRUPBACHER, JR., YA-02, DAF
Attorney-Advisor (International)
Office of the Staff Judge Advocate
49th Fighter Wing
490 First Street Suite 1940
Holloman AFB NM 88330-8277
DSN 572-7217/0861
Commercial 575-572-7217/0861
Fax 3998

-----Original Message-----
From: Westphal, Wesley J II Civ USAF ACC 49 CES/CEAO
Sent: Wednesday, October 29, 2008 10:20 AM
To: Brupbacher, Emil D Civ USAF ACC 49 FW/JAI
Cc: Hartell, Deborah J Civ USAF ACC 49 CES/CEA
Subject: RE: Golf Course Effluent Irrigation EA

Yes sir - if you could add the caveat that it's an OK legal document <smile>.

Thanks.

Wesley

-----Original Message-----
From: Brupbacher, Emil D Civ USAF ACC 49 FW/JAI
Sent: Wednesday, October 29, 2008 10:18 AM
To: Westphal, Wesley J II Civ USAF ACC 49 CES/CEAO
Cc: Hartell, Deborah J Civ USAF ACC 49 CES/CEA
Subject: RE: Golf Course Effluent Irrigation EA

I recall this but I cannot find my return e-mail. Maybe my coffee that day was no good. I know that I had no comments. Will this e-mail suffice?

Sorry.

Emil

EMIL D. BRUPBACHER, JR., YA-02, DAF
Attorney-Advisor (International)
Office of the Staff Judge Advocate
49th Fighter Wing
490 First Street Suite 1940
Holloman AFB NM 88330-8277
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-----Original Message-----
From: Westphal, Wesley J II Civ USAF ACC 49 CES/CEAO
Sent: Wednesday, October 29, 2008 10:06 AM
To: Brupbacher, Emil D Civ USAF ACC 49 FW/JAI
Cc: Hartell, Deborah J Civ USAF ACC 49 CES/CEA
Subject: Golf Course Effluent Irrigation EA

Emil –

On 29 September 2008, we submitted a Draft EA for the Golf Course Effluent Irrigation project and requested comments to be returned to us by COB on 10 October 2008.

I have been searching our files and can't find a copy of your comments.

Could you please resend?

Thanks.

Wesley J. P. Westphal II

Chief, Analysis

49 CES/CEV

575-572-6678 (DSN 572)